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MAY 1958

9th Annual Canadian Review Number

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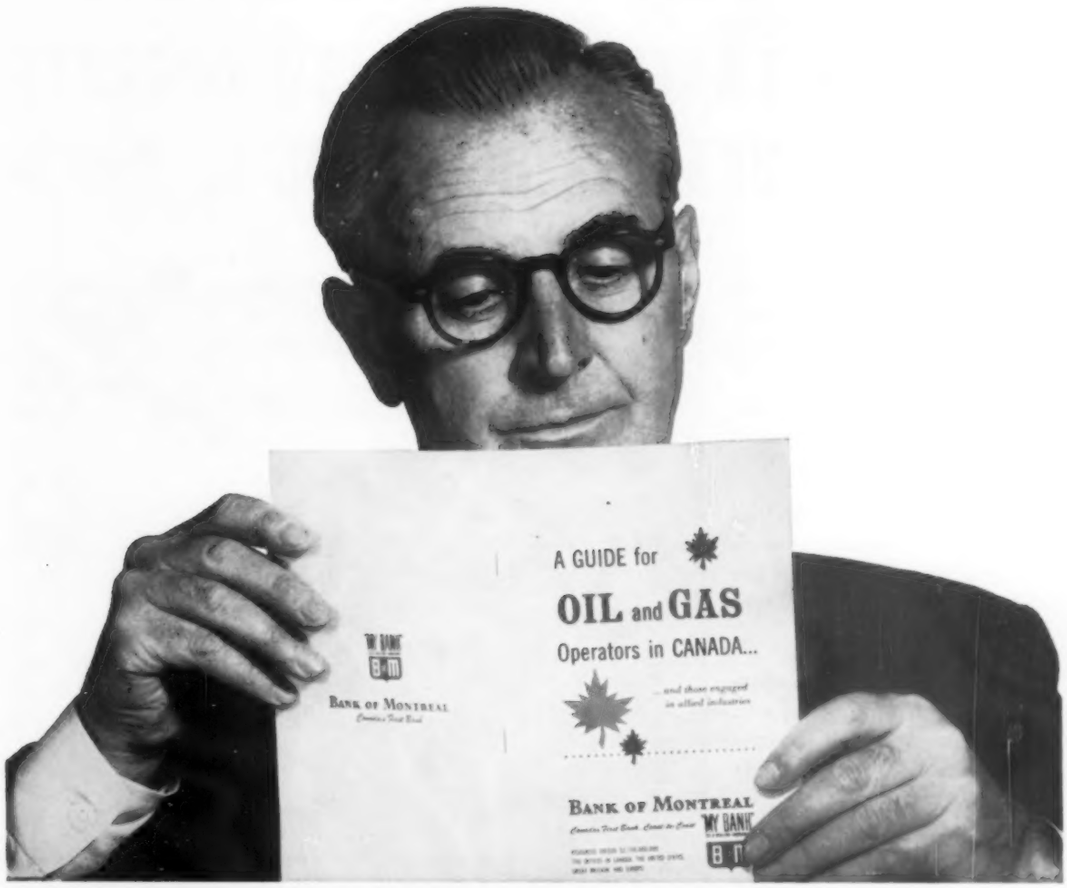

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New, revised edition of this 40-page handbook gives up-to-date facts on the ownership, disposition and operation of petroleum rights, province-by-province, in Canada. Highlighting information on Canadian company formation, immigration and customs as well, this booklet should travel in the briefcase of every American with petroleum interests north of the border.

Canada's First Bank, publisher of this concise guide, spans Canada's oil and gas provinces with more than 250 branches. Whether you need information, introductions or banking service in the Canadian petroleum world, call on the B of M.

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While the Bank is prepared to provide all available information on the petroleum industry, it does not make recommendations regarding the purchase of individual petroleum stocks.

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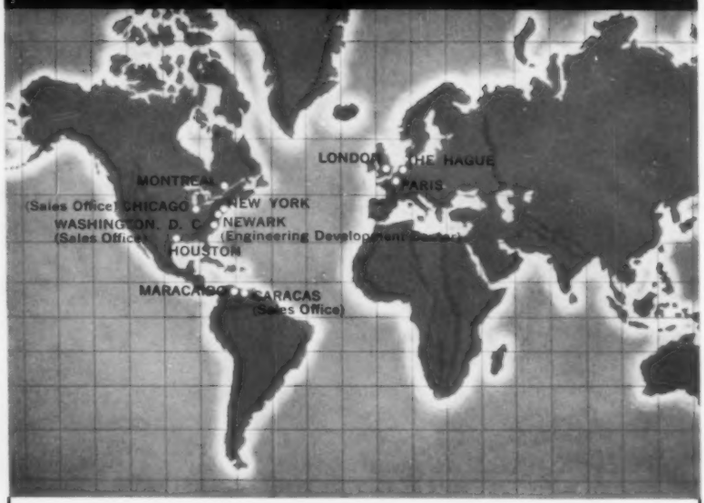

ABOVE — Location of Lummus offices and subsidiaries around the globe

BELOW — A few of the far-flung projects designed and constructed by Lummus

CHEMICAL PLANTS

Project	Location
Tetramer, Cumene and Phenol-Acetone Units, Societe des Chimiques des Derives du Petrole	Antwerp, Belgium
Sulfuric Acid Plant, Inland Chemicals Canada Limited	Fort Saskatchewan, Alberta, Canada
High Pressure Acetylene Chemicals Plant, General Aniline & Film Corp.	Calvert City, Kentucky, U.S.A.
Phenol-Acetone Plant, Progil-Electrochimie	Pont de Claix, France
Ethylene Oxide Plant for Petrochemicals Ltd.	Partington, England

COMPLETE REFINERIES

Irish Refining Co., Ltd.	Cork, Ireland
Burmah-Shell Oil Company	Bombay, India
Societe Generale des Huiles de Petrole	Dunkirk, France
Compañia Shell de Venezuela	Cardon, Venezuela
Standard Oil Company (Indiana)	Mandan, North Dakota, U.S.A.

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World Petroleum

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

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THIS MONTH'S COVER

When the night of Winter envelops McColl Frontenac Oil Companys Edmonton works, the cold, crisp air causes the refinery's lights to glisten with a special radiance. Located in Edmonton this is one of three refineries operated by McColl-Frontenac. The Edmonton refinery supplies the three Prairie Provinces of Manitoba, Saskatchewan, and Alberta, as well as eastern British Columbia. Photo by Robert Isear. Color plates are reproduced through the courtesy of Ellis Prudden, editor of *The Texaco Star*.

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Washington PIPE LINE

by Joseph Huttlinger

New Import Quotas

President Eisenhower has asked crude imports to Districts I through IV be reduced 713,000 b/d starting April 1—from 782,900 b/d. Twenty-four of the 26 importers are asked to cut back. The two had been bringing in 300 b/d each from Canada. Cuts will be 14.82% by September. New program is voluntary, except that government contracts will be denied to companies violating program.

Products are left uncontrolled; military purchase of jet fuels in increasing amounts in Caribbean area is not touched.

Fourteen newcomers are given quotas totaling 55,900 b/d; they had asked 148,000 b/d. Another 10 companies are denied quotas they had asked for.

Quotas have been denied companies which merely produce crude abroad, but they are given to companies owning refineries which can use the imported crude. Brokers are ruled out.

Action is viewed as too little and too late by some House and Senate members from oil-producing states, who will press the uphill fight for a mandatory quota law on the ground new program will be violated. Others complain the cuts are too steep.

Crude imports of 220,100 b/d allowed into District V are untouched by the new program.

Grand-Jury Price Investigation

Department of Justice is using telephone-company officials as it seeks evidence about oil prices and the antitrust laws at the 13-month-old proceedings before a federal grand jury at Alexandria, Va. The DJ asked a number of oil companies to come in with documents about talks with officials of any of 34 oil companies about the last general rise in crude and oil-product prices at the start of 1957.

Going further, DJ also issued subpoenas to seven telephone companies to come in with any documents which might indicate conversations between officials of any of the 34 companies. The period under study was December 15, 1956, to January 18, 1957.

Pipeline Construction

Construction of oil pipelines in the USA continues at a brisk pace—with more than 4,000 miles of crude and products lines scheduled for completion during 1958. Estimated cost will be at least $245 million; compared with 5,014 miles completed during 1957—about half and half between crude and products carriers. Estimated cost was $200 million.

Another 1,906 miles of line was converted last year from crude and natural-gas service to carrying of oil products, according to Committee on Oil Pipelines. Major single project of conversion was by Texas Eastern Transmission Corp., which turned the little "big-inch" line of the last war back to oil products from Baytown, Texas, to Moundsville, W. Va.

Major lines due for completion this year include these: *Crude lines* (1) Four Corners Pipe Line: 723 miles 12- and 16-in. from Aneth, Utah, to Los Angeles. (2) Texas-New Mexico Pipe Line Co.: 512 miles 16-in. from Aneth, Utah, to Jal, N. Mex. (3) Jaywalk Pipe Line Co.: 242 miles 10- and 12-in. from Mead to McPherson and Wichita, Kan.

Products Lines: (1) Laurel Pipe Line Co.: 440 miles of 14- and 20-in., Philadelphia to Cleveland. (2) Ohio Oil Co.: 265 miles 12-in. from Wood River to Chicago. Also, the Cherokee Pipe Line Co. will convert from crude to products its 398-mile line of 10-in. from Tulsa, Okla., to Wood River, Ill.

Import Quotas Battle

A strange lineup is developing as Congress works up more steam than at any time in at least 18 years for a quota law to limit crude-oil and product imports. Crude production in USA in the past few months has suffered the sharpest decline in many years, so that producers are calling for help. Congressmen find it popular to blame imports, and thus put in bills to roll back imports to the 1954 ratio to production. One measure calls for a tariff of 84¢ per bbl on crude.

President Eisenhower tried in vain to cut the ground from the drive by revising his voluntary oil imports program in two ways. He cut allowed imports into Districts I through IV by 70,000 b/d—asking present importers to cut back 15%. And he added teeth by moving to deny government business to companies exceeding their quotas. All the President accomplished was to stir up the pro-control forces. They claimed "if this is all he'll do, we'll have to get a law."

In the drive for more law, congressmen from oil-producing states are the leaders. They are going so far as to ally with coal, watch, textile, bicycle, and other USA interests. The unusual feature is that two men from Texas—among the most powerful in the country—head up the fight against tougher curbs on oil imports. One is aging House Speaker Sam Rayburn, an ardent believer in free trade. "The oil men have enough protection," he says.

The second is Senate majority leader Lyndon Johnson,—a younger man, with ambitions as high as the White House. While he speaks of "disaster" through excessive imports, he refuses to call for a law. It's up to the President, he explains. Privately, he warns further limits on imports will hurt exports of USA cotton and automobiles, and lead to oil price and rationing controls.

While the forces for a quota law on oil imports are stronger than ever, apparently, they still face an uphill fight. The result won't be known until mid-summer, when Congress expects to complete action on the reciprocal trade agreements act; but, when the showdown comes, Rayburn and Johnson are likely to be decisive figures.

NEW VOLUNTARY IMPORT SCHEDULE

(Thousands of Barrels Daily)

Importing Co.	Present	Effective date	April 1	July 1	Sept. 1
Established Importers					
Atlantic Refining Co.	58.9	.....	53.5	51.7	50.2
Gulf Oil Corp.	111.6	.....	101.3	98.0	95.1
Sinclair Refining Co.	62.2	.....	56.5	54.6	53.0
Socony Mobil Oil Co., Inc.	67.1	.....	60.9	59.0	57.2
Standard of California	66.8	.....	60.7	58.7	56.9
Standard Oil (N. J.)	72.0	.....	65.4	63.2	61.4
Texas Co.	54.5	.....	49.5	47.9	46.4
Subtotal	493.1	.....	447.8	433.1	420.2
New Importers					
Aurora Gasoline Co.	....	9-1-58	....	....	3.5
Bay Refining Corp.	3.2	.....	2.9	2.8	2.7
Cities Service Co.	32.6	.....	29.6	28.7	27.8
Clark Oil & Refining Co.	....	4-1-58	2.0	2.0	2.0
Continental Oil Co.	....	8-6-58	....	....	5.0
Crown Central Petroleum	5.0	.....	4.5	4.4	4.3
Denaho Refining Co.	....	7-24-58	....	....	0.5
Delta Refining Co.	....	8-3-58	....	....	3.0
Dow Chemical Co.	0.3	.....	0.3	0.3	0.3
Eastern States Petroleum	18.3	.....	16.6	16.1	15.6
Gabriel Oil Co.	7.5	.....	6.8	6.6	6.4
Great Northern Oil Co.	33.0	.....	30.0	29.0	28.1
Hess, Inc.	11.5	.....	10.4	10.1	9.8
Ingram Oil & Refining Co.	....	7-15-58	....	3.5	3.5
International Refining Co.	12.3	.....	11.2	10.8	10.5
Lakehead Pipe Line Co.	0.3	.....	0.3	0.3	0.3
Lake Superior Refining	5.0	.....	4.5	4.4	4.3
Northwestern Oil & Refg.	13.5	.....	12.3	11.9	11.5
Ohio Oil Co.	....	8-12-58	....	....	3.5
Phillips Petroleum Co.	12.0	.....	10.9	10.6	10.2
Pure Oil Co.	....	6-10-58	....	5.0	5.0
Republic Oil & Refining	....	7-1-58	....	4.0	4.0
Shell Oil Co.	7.5	.....	6.8	6.6	6.4
Standard Oil Co. (Ind.)	29.8	.....	27.1	26.2	25.4
Standard Oil Co. (Ohio)	8.2	.....	7.4	7.2	7.0
Sun Oil Co.	50.4	.....	45.8	44.3	43.0
Sunray Mid-Continent Oil Co.	....	9-1-58	....	....	5.0
Southwestern Oil & Refg.	2.9	.....	2.6	2.6	2.5
TGT & Bay Petroleum	....	6-16-58	....	3.5	3.5
Texas Asphalt & Refining	2.3	.....	2.1	2.0	2.0
Texas City Oil & Refg.	....	7-1-58	....	4.0	4.0
Tidewater Oil Co.	34.2	.....	31.1	30.0	29.2
United Refining Corp.	....	7-1-58	....	3.0	3.0
Subtotals	289.8	.....	265.2	279.9	292.8
Totals	782.9	.....	713.0	713.0	713.0

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OFF CALIFORNIA a geologist-frogman dives deep to the ocean floor in search of petroleum-bearing rock for Texaco.

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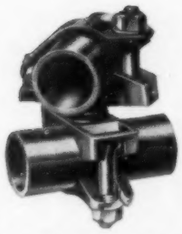

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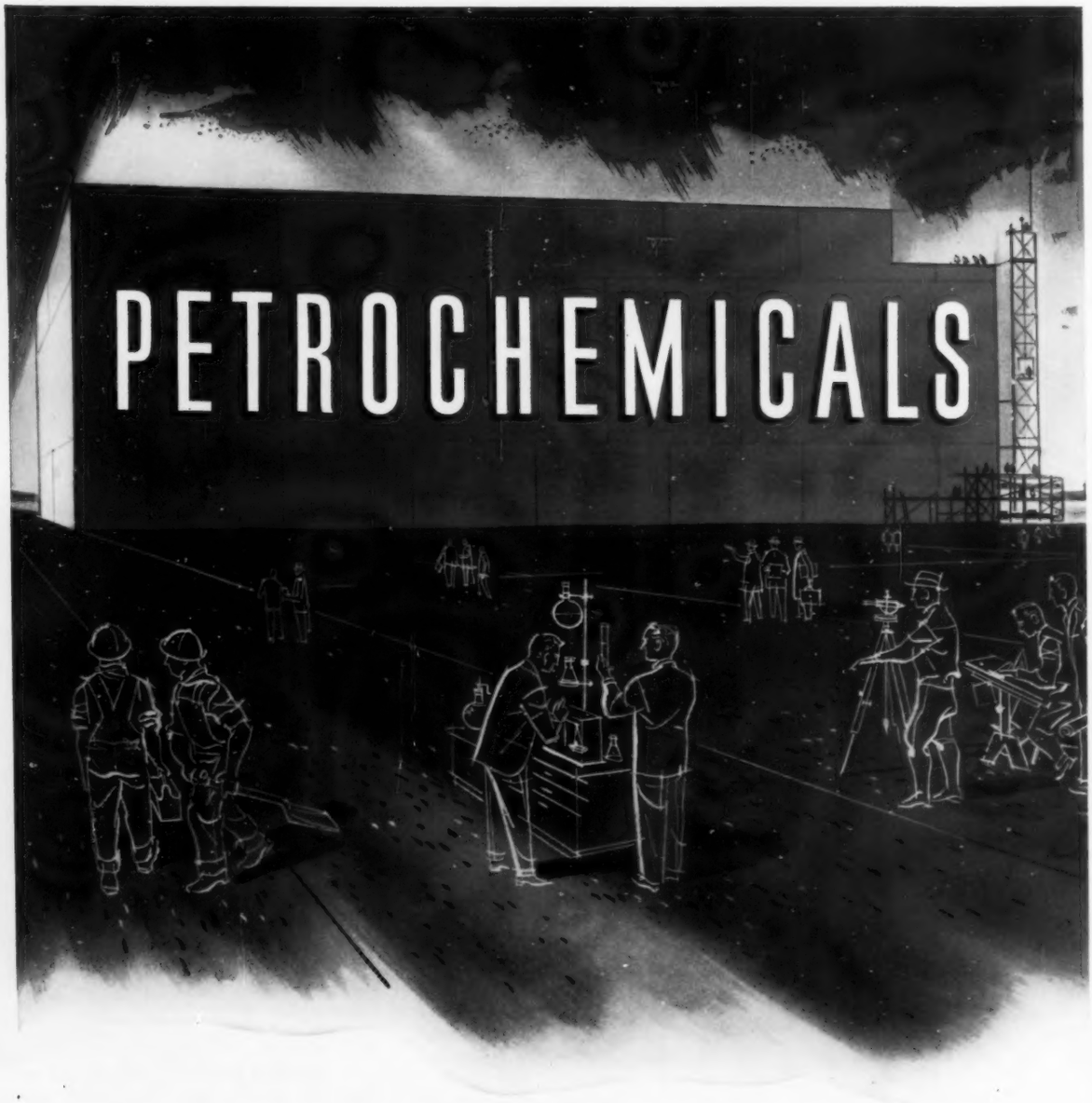

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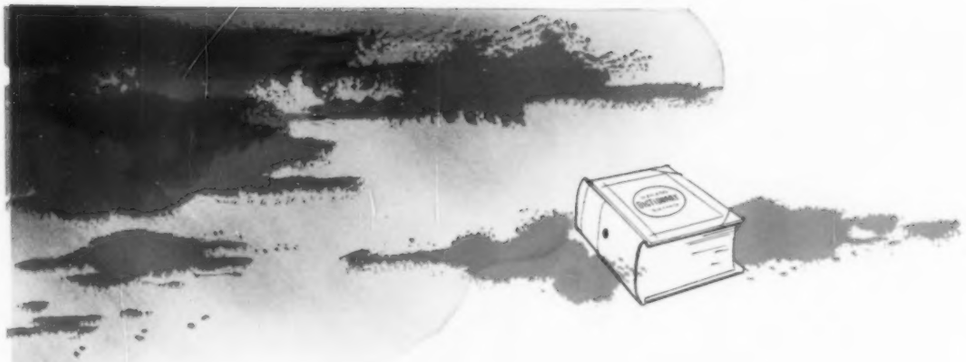
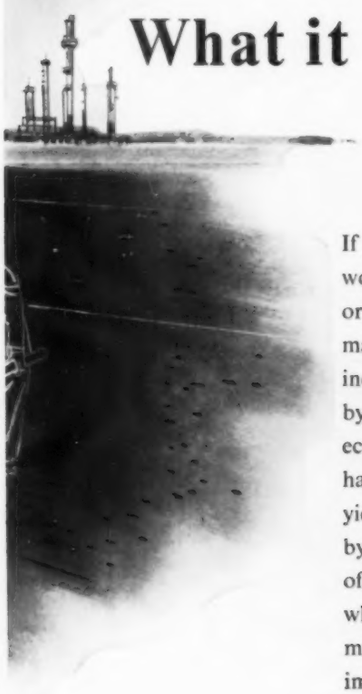


What it takes to build a new word



If your dictionary isn't the latest copy, chances are you won't find the word "Petrochemical" in it. It only got into the book a year or so ago. But a lot of time, thought and work went into its building. For many years scientists, designers and engineers in the petroleum industry have been developing the techniques for producing these important by-products that today make this word a most important one in our economy. For instance, here at UOP our research and engineering staff have been working for years, actively developing processes which yield valuable petrochemicals from petroleum raw materials and refinery by-products. Today UOP makes available to all refiners a number of petrochemical processes. These provide chemicals for the synthetics which have become part of our daily lives through their application to so many products now essential to our standard of living. Too, they help improve the economic efficiency of petroleum refining. UOP will be glad to supply, without obligation, individual recommendations for the practical application of its various petrochemical processes to any refining operation, anywhere in the free world.

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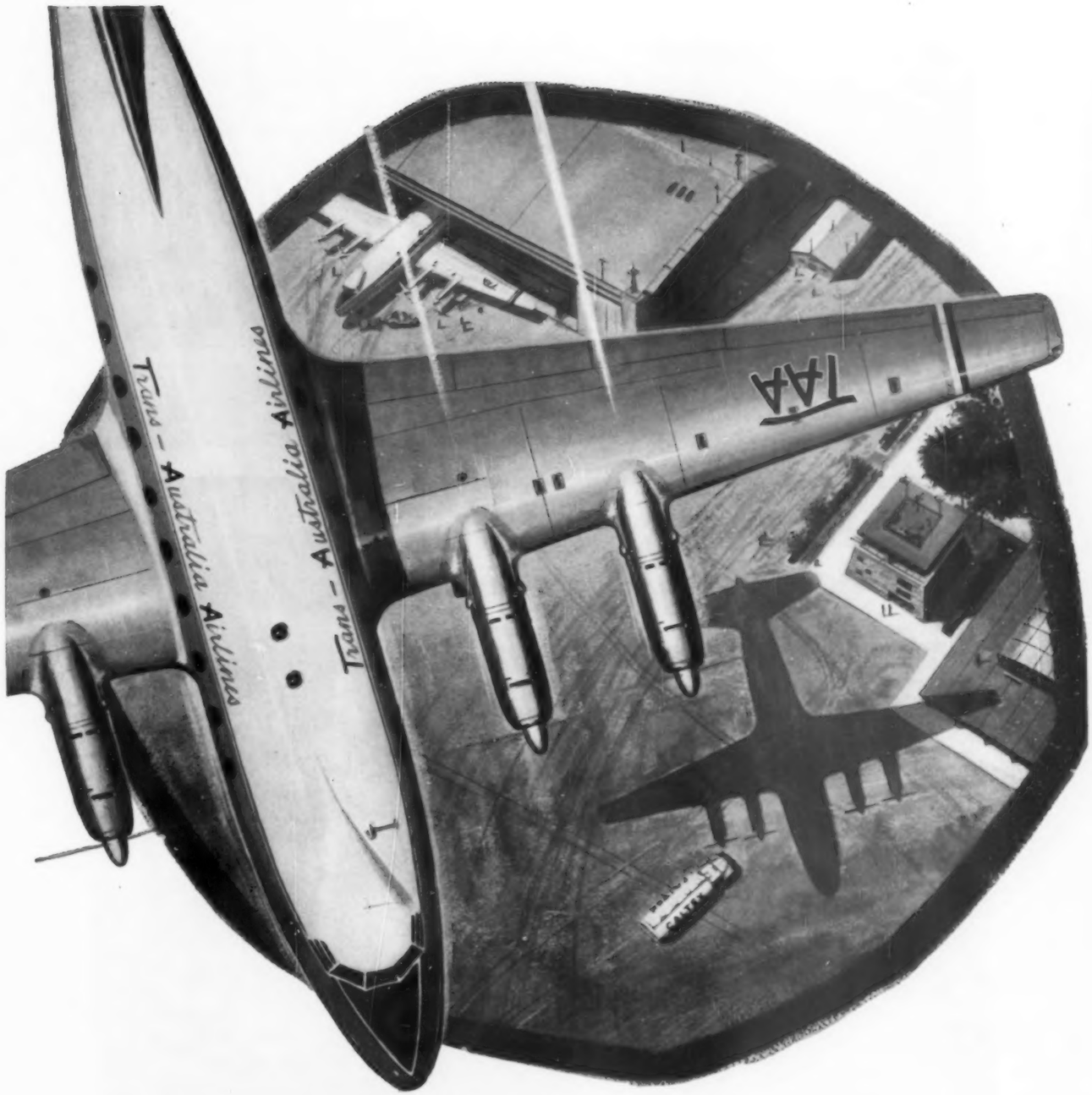

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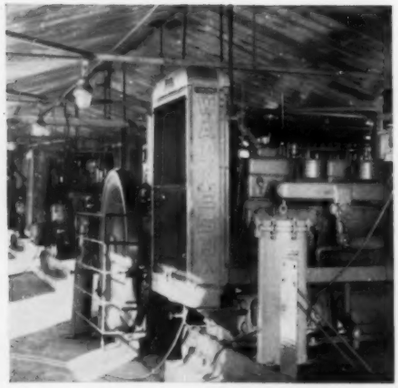

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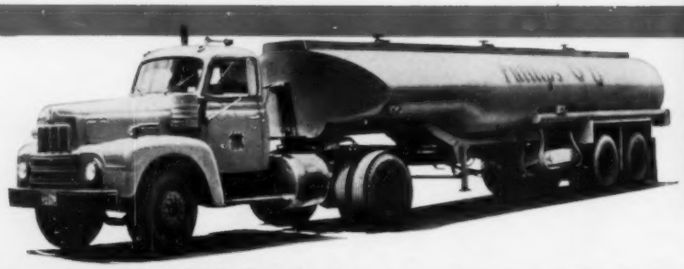

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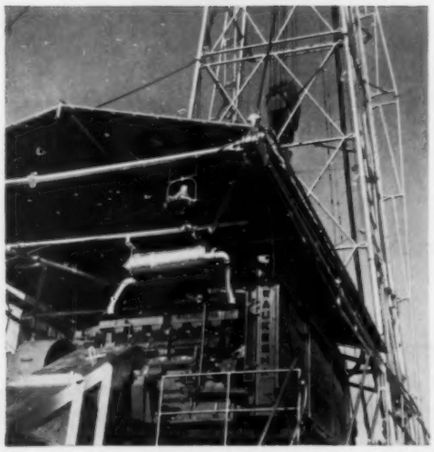

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Good functional design is evident in the compact layout and easy access to equipment which are features of General Petroleum Corporation's new catalytic reformer. The reformer, now in operation at the Ferndale Refinery of this Socony Mobil company, has a capacity of 9000 barrels per day. It is the second unit of its type completed since 1954 in a refinery originally engineered and built by Bechtel as a "grass roots" project.

BECHTEL CORPORATION

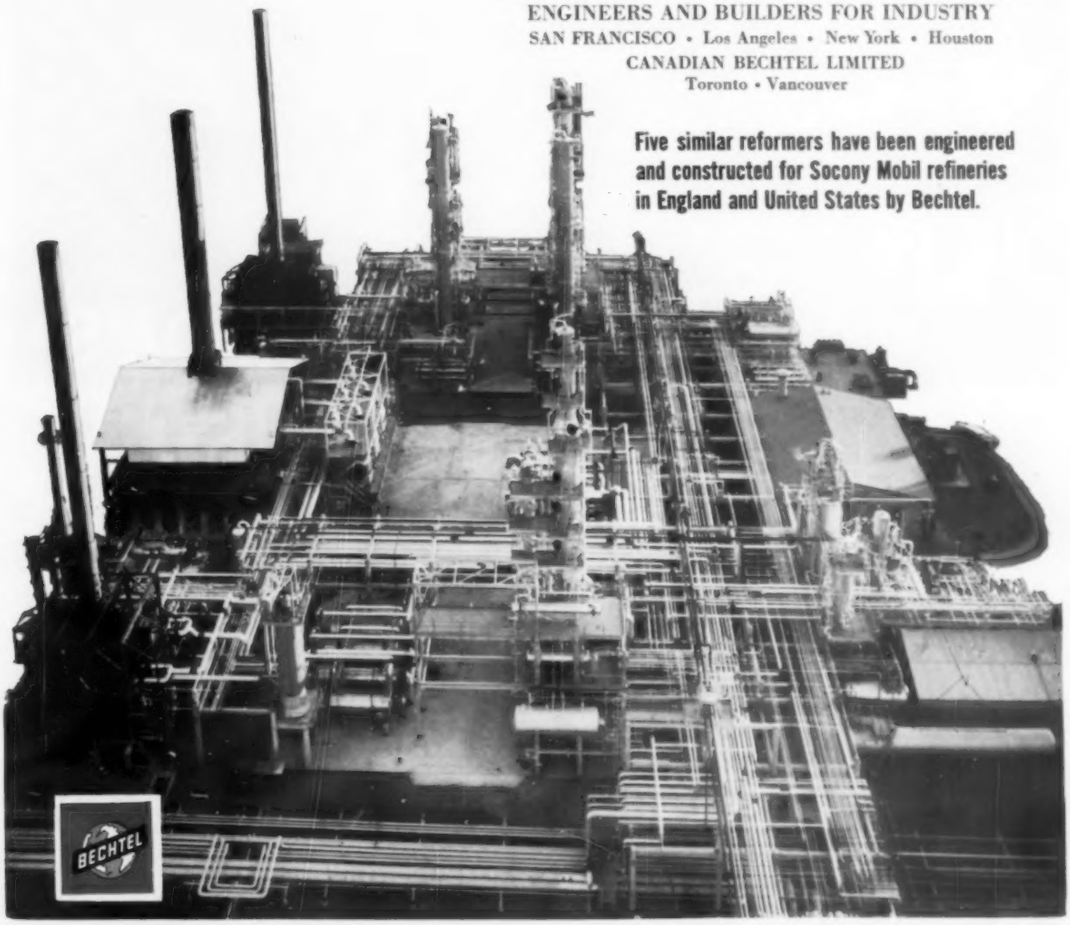
ENGINEERS AND BUILDERS FOR INDUSTRY

SAN FRANCISCO • Los Angeles • New York • Houston

CANADIAN BECHTEL LIMITED

Toronto • Vancouver

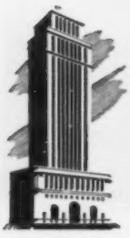
Five similar reformers have been engineered and constructed for Socony Mobil refineries in England and United States by Bechtel.



DOMINANCE IN CANADA'S OIL AND GAS INDUSTRY

Famed Montreal landmark, the beacon-topped tower of the Royal Bank's Head Office building, dominates the skyline. Dominating, too, has been this bank's role in the growth of Canada's oil and gas industry. Since the earliest days of the country's petroleum development, the 'Royal' has been known as Canada's Oil and Gas Bank. Today, through some 300 on-the-spot branches throughout the oil-rich western provinces, and with a special Oil and Gas Department at Calgary, the bank serves an ever increasing number of oil and gas clients, including many of the most prominent in the field. Whatever phase of the industry you are engaged in, you will find many advantages in making the Royal Bank *your* bank, too.

We do not provide information on oil securities.



THE ROYAL BANK OF CANADA

Canada's Oil Bank

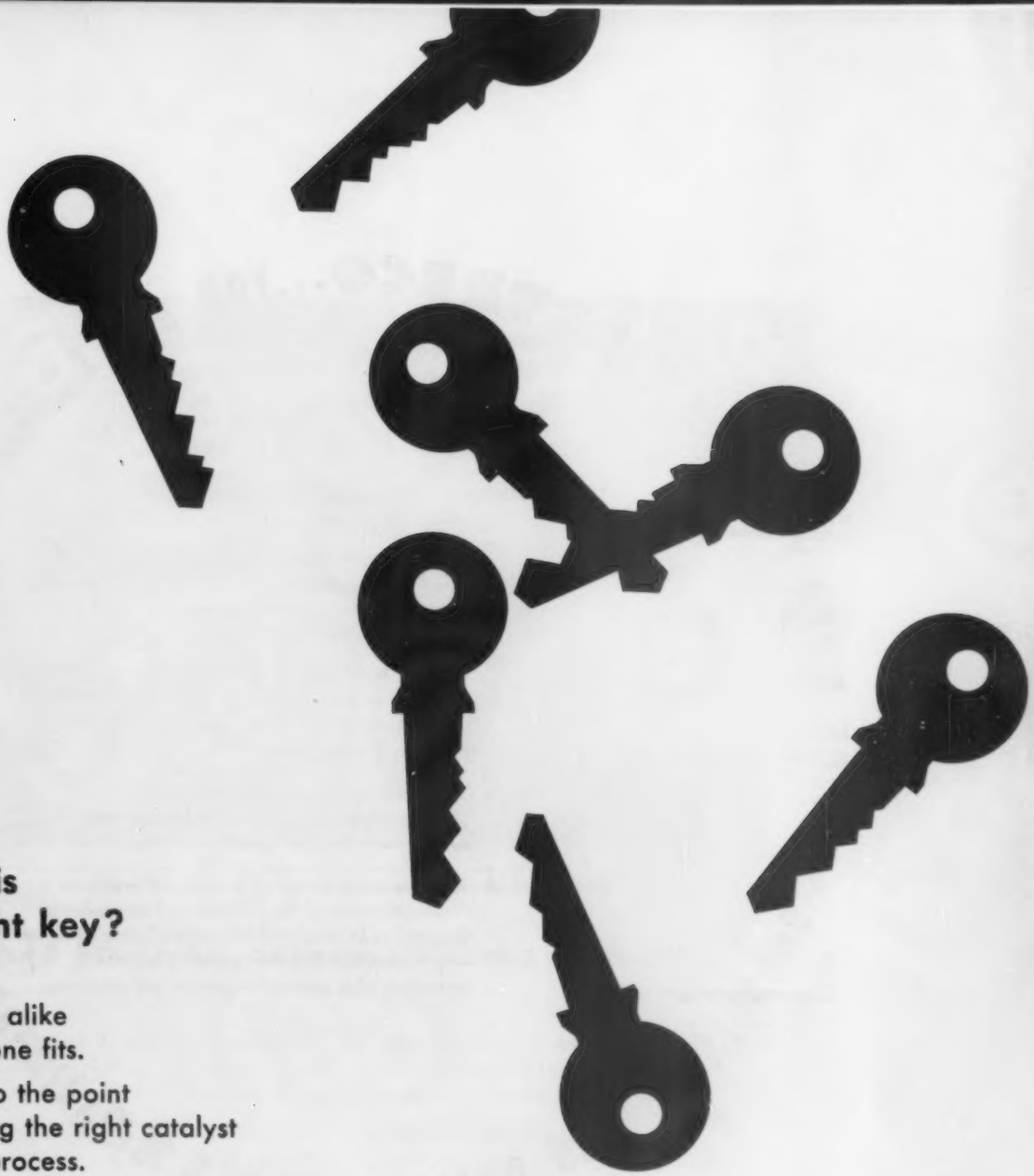
New York Agency—68 William Street, New York 5, N. Y.

Head Office—Montreal

Assets exceed 3¾ billion dollars

Over 900 branches in Canada, the West Indies, Central and South America. Offices in New York, London and Paris.

For a free map of Canada's oil and gas fields and a list of the Royal Bank's current "Oil and Gas Bulletins," write to The Royal Bank of Canada, Oil and Gas Department, 409 Eighth Ave. West, Calgary, Alberta.



Which is the right key?

They look alike
but only one fits.

That's also the point
in choosing the right catalyst
for your process.

We furnish to the Petroleum Industry catalysts for cracking and reforming

particularly for TCC-,
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WHEN YOU SPECIFY PETRECO... YOU BUY CONTINUOUS SERVICE

Petreco electric petroleum treating equipment offers you continuity in *two* senses.

First, in your day-to-day operation, a Petreco installation means the *uninterrupted flow* of a precisely treated product (whether it be a producing or a refining operation).

Secondly, and in the broader sense, it means perfect assurance of *service "follow-through"*—the kind of future organizational support you have a right to expect from a leader in its field.

The results are: (1) the *proper design* for your operation and, (2) a *constant concern* for your treating problems—not just for today, but for the years ahead.

Throughout the petroleum world, Petreco processes *and services* are eliminating many of the problems and uncertainties that used to be consigned to intuitive "guess"timations—operations that Petreco equipment is now controlling with *automatic* regularity and precision.

WHEN YOU SPECIFY PETRECO... YOU BUY CONTINUOUS SERVICE

FOR FURTHER INFORMATION ON THE
CONTINUOUS • AUTOMATIC • COMPACT • ECONOMICAL OPERATION
of the FOLLOWING PROCESSES...

ELECTROFINING • SWEETENING • DESALTING • LUBE OIL TREATING
DESAPONIFICATION • SEDIMENT SEPARATION • DEHYDRATION

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A DIVISION OF PETROLITE CORPORATION

AP-58-1

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Specialized Petroleum Treating Processes and Equipment—DESALTING • DEHYDRATING • DISTILLATE TREATING • SWEETENING • LUBE OIL TREATING SEDIMENT REMOVAL

Aerial view of Hughes plant . . . world's largest and most modernly equipped rock bit manufacturing plant. Also located within the 70-acre area is the block-long Hughes Research and Engineering Laboratory.

What Hughes offers Drilling Industry

1. **Complete stock of bits** . . . in required sizes and types . . . manufactured in sufficient quantities to meet the needs of the entire industry.

2. **Bit recommendation service:** Hughes can make available to you a recommended bit program for any area — based on the industry's greatest rock bit experience.

   And you can get information which will enable you to correlate bit types with formations, with your drilling practice and hydraulic capacity of your equipment.

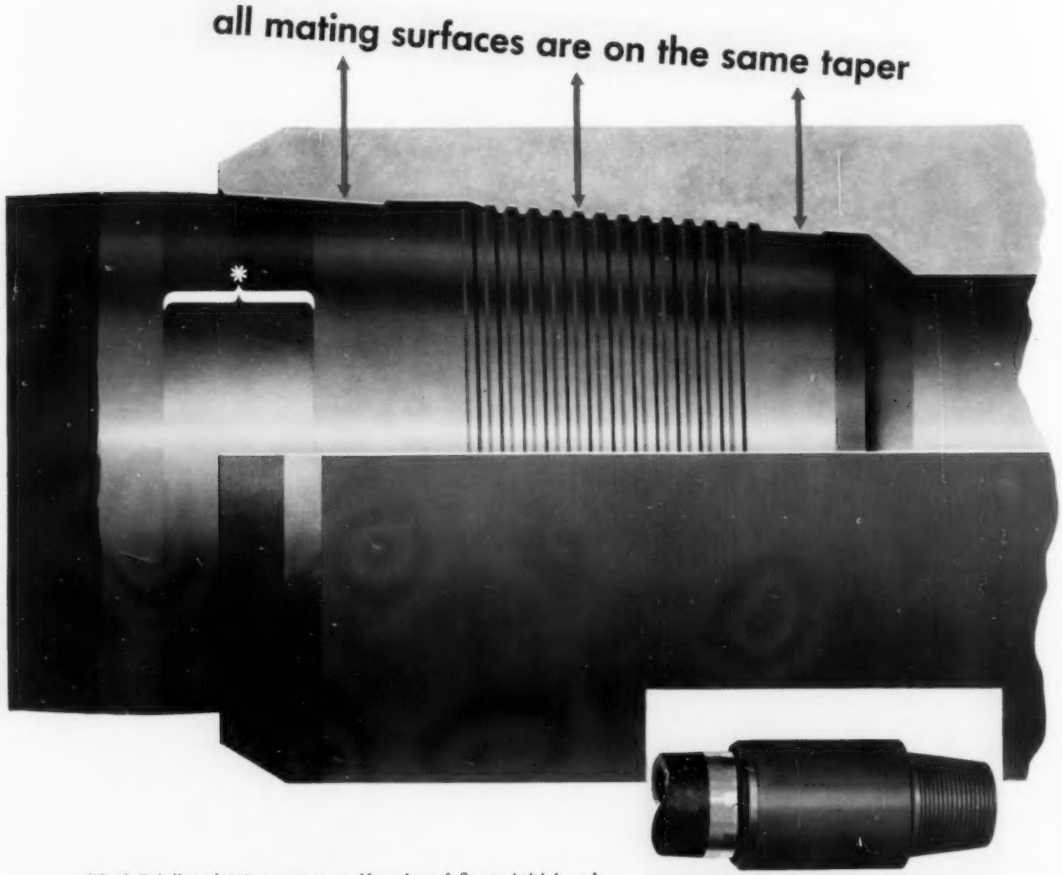
   Also, Hughes has two copyrighted hydraulic bulletins that can aid you in getting the most out of your present equipment and in the selection of new equipment.

3. **Continuous drilling research** . . . carried on in the laboratory and field for nearly a half century. Facts obtained in the laboratory and field are used in developing new and improved rock bit designs and in anticipating the problems created by changing drilling techniques.

4. **Industrywide organization** and system for gathering information and forecasting bit requirements for each drilling area. This assures you that no matter where you drill, Hughes bits of the right sizes and types will be available to meet your particular drilling requirements.

WHEN YOU RELY ON HUGHES YOU TAKE THE GUESSWORK OUT OF BIT SELECTION

Your most versatile replaceable tool joint



"Seal-Grip" tool joints assure uniformity of fit on initial and replacement installations because all mating surfaces — the *outer seal, pipe threads* and *inner seal*—are on the same taper.

This means that whether you install new "Seal-Grip" joints on new or old pipe, or old joints on new or old pipe, you get a safe, sure tool joint-to-pipe connection every time.

*A Hughes extra! The new method of cold-rolling the large land area of "Seal-Grip" drill pipe at the mill — developed by Hughes — greatly strengthens this critical area.

When you specify "Seal-Grip," you get the *strongest* and most *versatile* field replaceable tool joint assembly you can buy!

HARDFACING IN DEPTH — a development of Hughes — is also available on "Seal-Grip" joints.

SEAL GRIP®

A DEVELOPMENT OF

HUGHES TOOL COMPANY

HOUSTON, TEXAS

10 ways to protect the quality of your petroleum products

THE UOP FAMILY OF SUPERIOR ADDITIVES AND INHIBITORS SERVING THE PETROLEUM INDUSTRY

PRODUCT	APPLICATION
UOP NO. 1* Inhibitor, a phenolic fraction obtained from wood distillation.	Most economical way of obtaining antioxidant units.
UOP NO. 4* Inhibitor, a substituted aminophenol.	Protects unstable gasolines; potent for reducing copper dish gum.
UOP NO. 5* Inhibitor, N,N'-di-secondary butyl-p-phenylene-diamine.	Prevents gum formation and stabilizes tetraethyl lead; catalyzes air oxidation of mercaptans.
UOP NO. 5S* Inhibitor, phenylene-diamine type antioxidant.	Similar to No. 5 but catalyzes sweetening at a sharply increased rate.
UOP NO. 7* Inhibitor, crystalline dibutyl para cresol.	Inhibitor for relatively stable gasolines; stabilizes lead, insoluble in acid or alkaline tank bottoms.
UOP NO. S-7* a 33⅓% solution of UOP No. 7 in toluene.	Improved convenient form of No. 7 for liquid injection into gasoline.
COPPER DEACTIVATORS Regular Grade—80% active ingredient. AW* (50) Grade—50% active ingredient.	Prevents traces of copper from interfering with the action of the above inhibitors. Synergist for fuel oil inhibitors and dispersants.
UNICOR® ash-free, low nitrogen, oil-soluble corrosion inhibitor.	Protects refinery equipment, storage tanks and pipe lines from corrosion. Active over wide pH range.
UNICOR® LHS anti-icer and corrosion inhibitor.	When added to gasoline it eliminates stalling caused by carburetor ice. An excellent corrosion inhibitor for all distillate streams; particularly useful in liquid propane and butane.
POLYFLO* 100 an all-organic inhibitor-dispersant.	For all fuels and diesel oils: 1) To improve jet fuel thermal stability. 2) To stabilize No. 2 heating oils and diesel fuels against color deterioration and sludge deposition. 3) To eliminate fouling in feed exchangers and reboilers. 4) To eliminate tank bottoms in crude and residual oil storage tanks.

You're always sure of best quality, best performance when the additives and inhibitors you use are labelled "UOP"

*Trade Mark

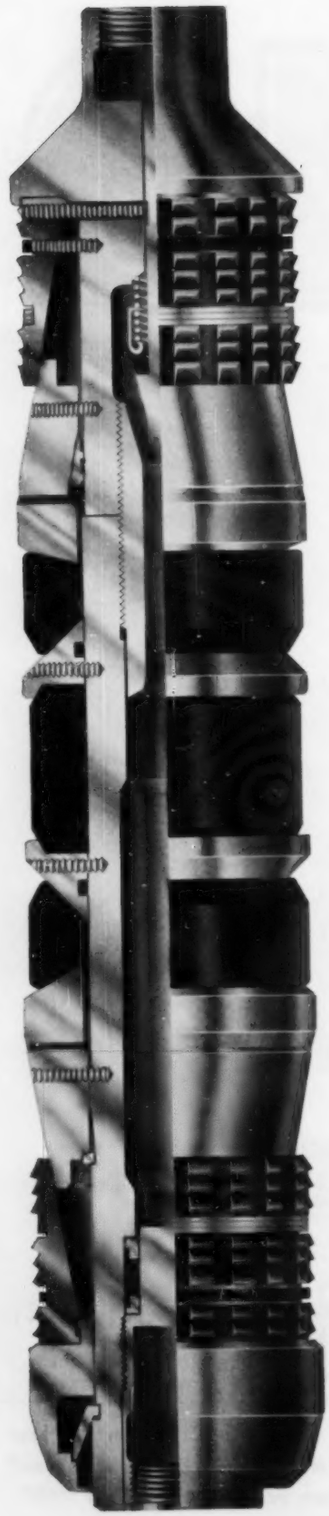
UNIVERSAL OIL PRODUCTS COMPANY
30 Algonquin Road, Des Plaines, Illinois, U.S.A.

the new Welex "DM" and "DC"

BRIDGE PLUGS

insure a positive seal

The new Welex "DM" and "DC" Bridge Plugs are designed solely for one purpose: to give you the best pressure-tight temporary or permanent bridge at any desired depth at the most economical price to you. With the Welex Bridge Plug, you have positive setting action, three seal rings to insure a positive seal at any depth, a plug designed to withstand higher pressure than is safe to apply to your casing, a permanent or temporary bridge that may be drilled later to re-enter lower zones, a plug that will last longer in salt water, yet a plug that, most of all, is economical to you. Made of high strength drillable magnesium alloy and high strength drillable cast iron, the Welex "DM" and "DC" Bridge Plugs are your best buy when you desire effective sealing with a more durable plug at the most economical price.



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GENERAL OFFICES: FORT WORTH, TEXAS

Division Offices in Dallas, Denver, Houston, Los Angeles, Midland, New Orleans, Tulsa and Wichita. Districts in all major oil centers. Subsidiaries in Canada, Peru and Venezuela.

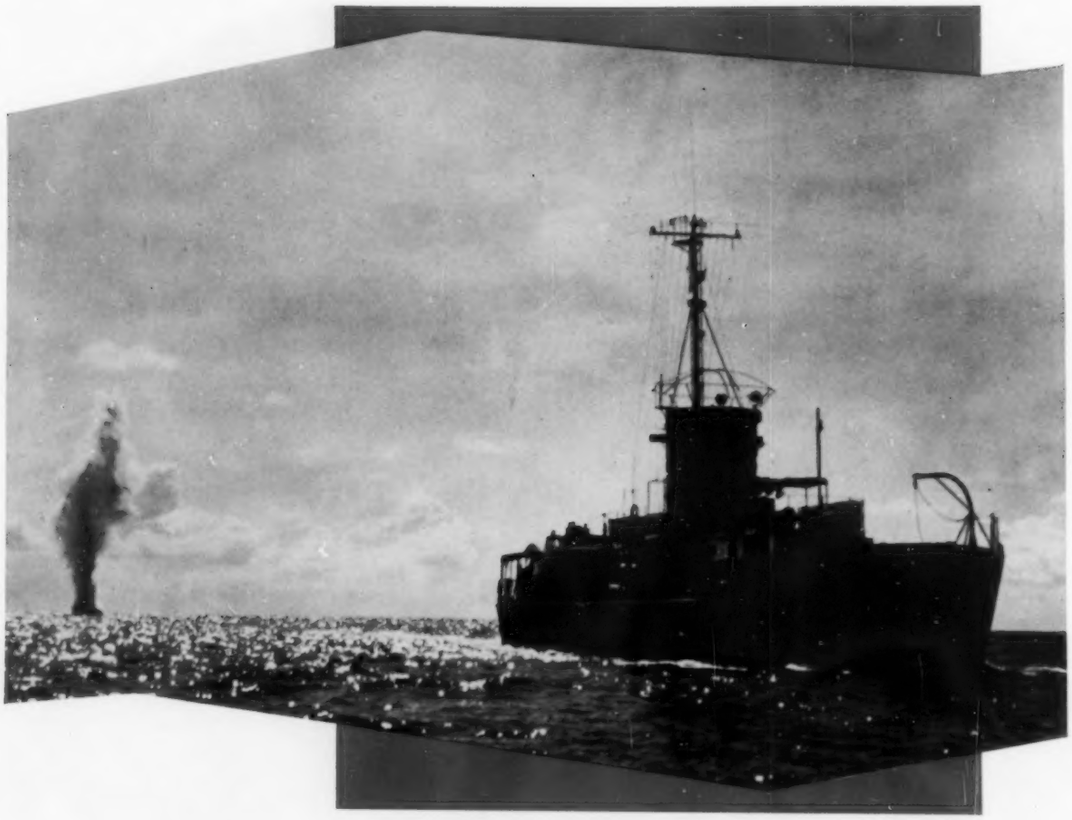
Heart of a Growing Canadian

Everywhere the skyline of our land is changing—a sign of Canada's vigour and strength.

Early this fall, the 13-storey Shell Building at 505 University Avenue, Toronto, will be completed. It will be the center of all the operations of Shell Oil Company of Canada, Limited—home base for more than 4,000 Shell men and women throughout the nation.

This is the heart of a growing Canadian.

SHELL OIL COMPANY OF CANADA, LIMITED



have ship . . . will search

GSI's Motor Vessel SONIC is currently conducting marine seismic surveys in the Eastern Hemisphere. If you are planning offshore exploration in this area, you can:

- save up to 75% the cost of an equivalent-coverage land survey
- pinpoint areas of interest rapidly and accurately
- fully evaluate known structures through seaward extension of land work

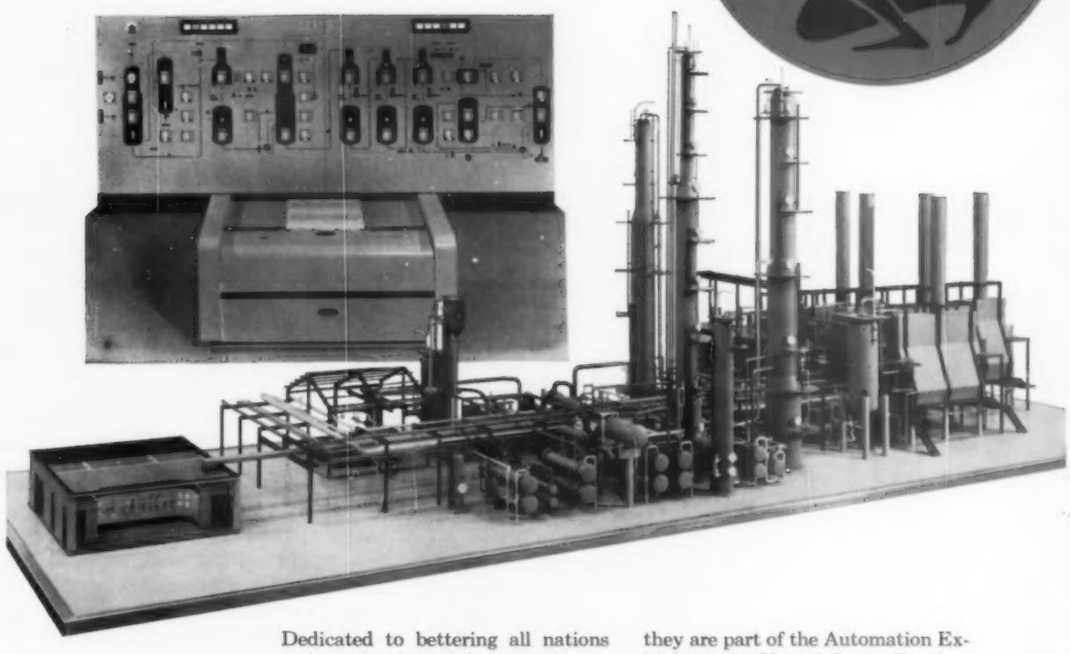
Write for additional details on availability of the SONIC, a fully-equipped, 405-ton ocean-going vessel which pioneered the single-ship method of marine seismic surveying.

GSI . . . continuing leadership through research and growth

GEOPHYSICAL SERVICE INC.

100 EXCHANGE PARK NORTH • DALLAS 35, TEXAS

At the Brussels World's Fair



Dedicated to bettering all nations and peoples through better exchange of knowledge, the Brussels World's Fair provides a proper setting for the contributions made to mankind by petroleum and chemical engineering. Source of countless useful products, the petroleum and chemical industries have raised their own efficiency as well as world standards of living through technological progress. Typical are the advances made recently in automation.

This scale model of a Kellogg catalytic reformer and the replica of the Kellogg-designed control room demonstrate the trend to automatically controlled processing units. Together they are part of the Automation Exhibit at the United States Pavilion at Brussels. The scale model, built by Kellogg as a design tool for actual plant engineering and construction, was furnished by Kellogg. The graphic panel and data reduction console were built by Panellit, Inc.

These newest developments in a process and its control are being exhibited by the United States of America as examples of the technological accomplishments of free enterprise that benefit all mankind. Kellogg, proud of its part in them, is ready to serve all national economies with advanced engineering and construction services.

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The M. W. Kellogg Company
711 THIRD AVENUE, NEW YORK 17, N. Y.

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FOR PAYLOADS OF **67,000** lb.

The Scammell CONSTRUCTOR pays off handsomely

One of the Scammell 25′ W/B 6 x 6 Super Constructor Oilfield Bed-trucks carrying a skid-mounted National engine operating over desert tracts in Kuwait.

It's payload that counts in oilfield transportation. And that's where the Scammell 6 x 6 Constructor scores every time. 30 ton unitized loads come easily to this purpose-built giant. Fitted with 200 b.h.p. 6 cylinder diesel engine, 6 speed gearbox and transposing box giving 12 forward speeds, independent drive to all three axles and power assisted steering, it operates efficiently over any type of ground carrying its load of skid-mounted equipment up to desert rigs.

From a range of transport with capacities up to 150 tons, Scammell can supply tankers; heavy motive units; trucks for mounting well servicing hoists, cranes, excavators, drill rigs; and vehicles for all aspects of oilfield operation.

Every Scammell is a purpose-built job, designed and constructed by specialists to the operator's own specification. May we build to yours?

A 21′ 9″ W/B 6 x 6 Constructor fitted with oil well servicing and drilling rig.

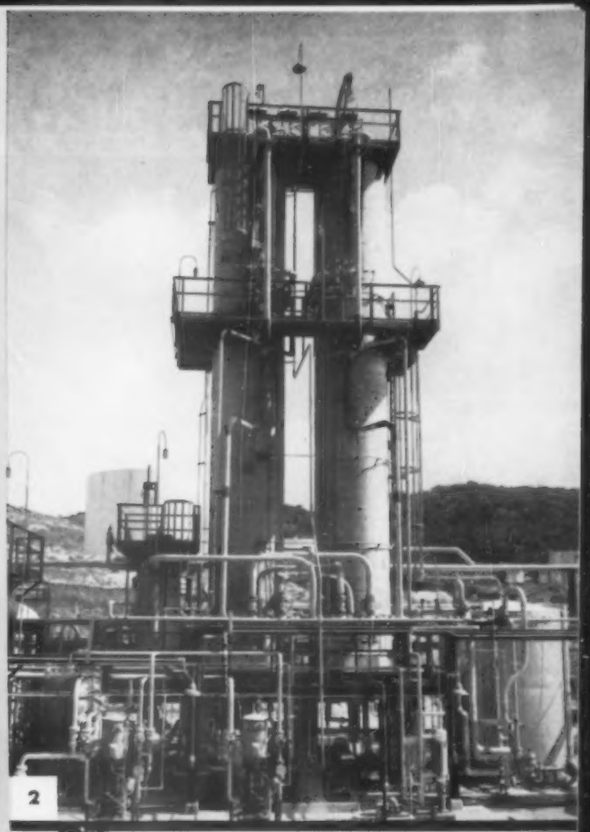
SCAMMELL

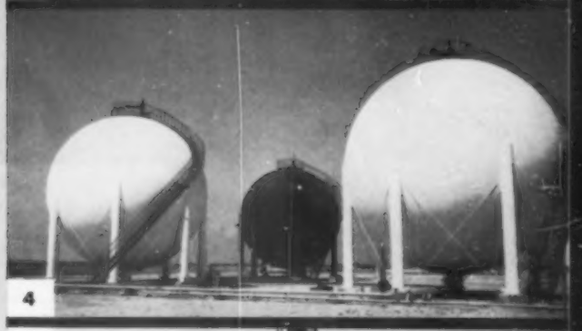
For purpose-built 'on or off the road' vehicles from 3 tons to 150 tons

SCAMMELL LORRIES LTD. *Export Division:* HANOVER HOUSE, HANOVER SQUARE, LONDON W.1, ENGLAND

where there's Refining

–there's CB&I





102 CB&I -built structures serve Commonwealth Oil Refining Co. at Ponce, Puerto Rico

CB&I engineered structures, whether for petroleum storage or petroleum processing, are built to serve as "working partners" for one goal—to provide the optimum yield from every barrel of crude.

Nearly 70 years of carefully coordinated engineering, fabrication and erection experience back the *craftsmanship in steel* that has brought CB&I services to world petroleum prominence. And a network of *world representation* places the efficiency of these services at *your* service, anywhere in the world.

For example: CB&I fabricated and erected *102* structures for the Commonwealth Oil Refining Company operation at Ponce, Puerto Rico. Here, CB&I vessels store over 2,300,000 barrels. *Twelve* CB&I-built processing structures, including the reactors, Houdry units and towers shown here, serve as *working partners* to make the most of every barrel processed through this ultra-modern refinery.

Write our nearest office for details.

1. **Crude unit,** with crude tower at left and vacuum tower at right.

2. **Hortonclad® reactors** are 47-ft. high and built of 316L stainless steel on A212 carbon steel backing.

3. **Fractionating** tower is shown at left, vacuum tower is at right.

CB&I storage vessels handle over 2,300,000 barrels at Commonwealth:

4. **5000-bbl. Capacity Hortonspheres®** are 38 ft. in diameter.

5. **Horton®** cone-roof storage tanks.

6. **Houdry Unit** Catalytic Cracking Unit was fabricated and erected by CB&I.

Structures were furnished through The Lummus Company.

P70CB

CB&I

Chicago Bridge & Iron Company

Plants in: BIRMINGHAM, ALA. • CHICAGO, ILL. • GREENVILLE, PA. • SALT LAKE CITY • NEW CASTLE, DEL.

REPRESENTATIVES, LICENSEES and SUBSIDIARIES: Australia—Bernard-Smith (Pty.) Limited, Alexandria (Sydney); Evans Deakin & Co. Ltd., Brisbane • **Canada**—Horton Steel Works Limited, Toronto • **Cuba**—W. P. Bryant, Edifico Abreu 402, Havana • **Brazil**—Sociedade Chibridge de Construcoes Ltda., Rio de Janeiro • **England**—Chicago Bridge Limited, London; Whessoe Limited, Darlington • **France**—Constructions Metalliques de Provence, Arles-sur-Rhone; S. A. Ateliers et Chantiers de la Seine Maritime, Le Trait • **Germany**—Wilke-Werke AG, Braunschweig; Gutehoffnungshutte, Oberhausen-Sterkrade • **Italy**—Compagnia Tecnica Industrie Petroli, Rome • **Japan**—Ishikawajima Heavy Industries Co., Ltd., Tokyo • **Netherlands**—Comprimo N. V., Amsterdam • **Scotland**—The Motherwell Bridge & Engineering Co., Ltd., Motherwell • **Venezuela**—Chicago Bridge & Iron Company Ltd., Caracas

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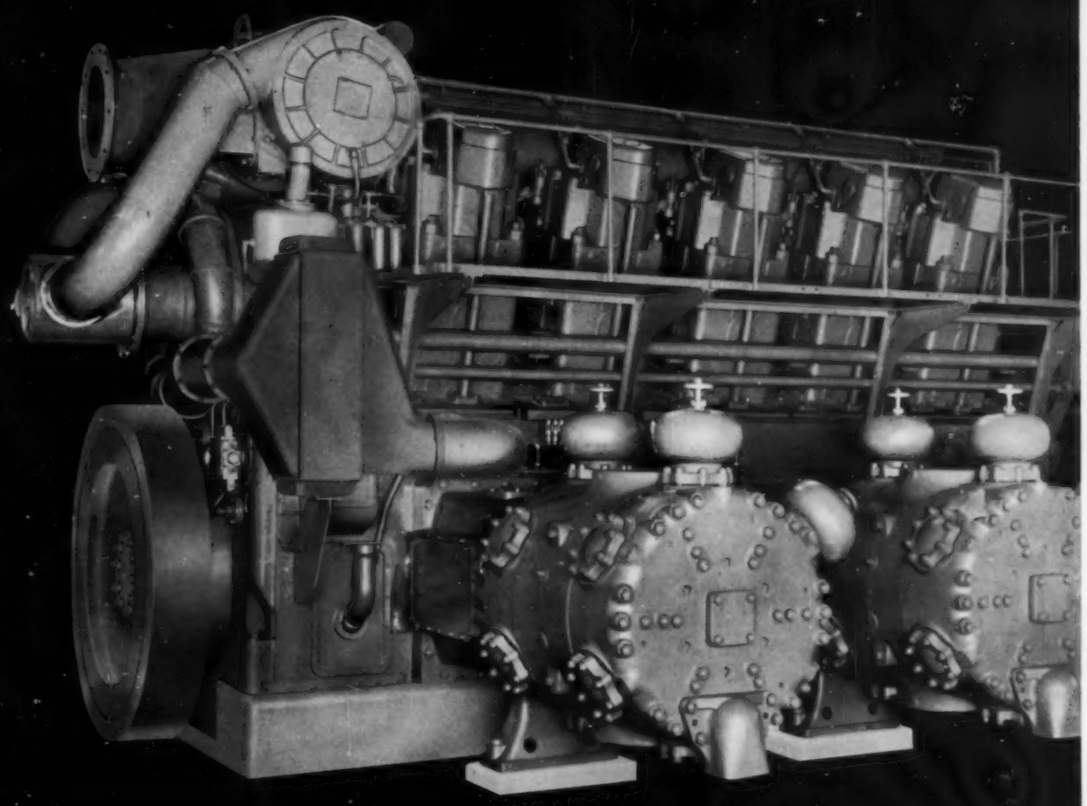
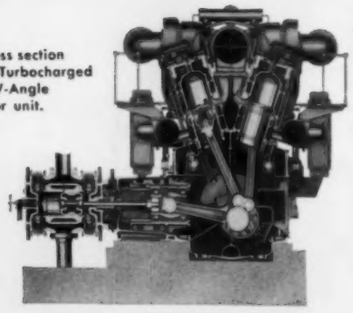
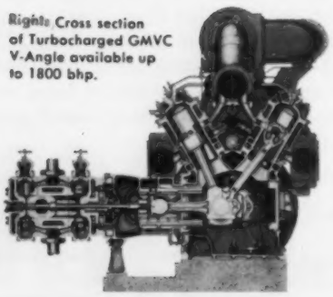
Full range efficiency....



Right: Cross section of Series Turbocharged GMWC V-Angle compressor unit.



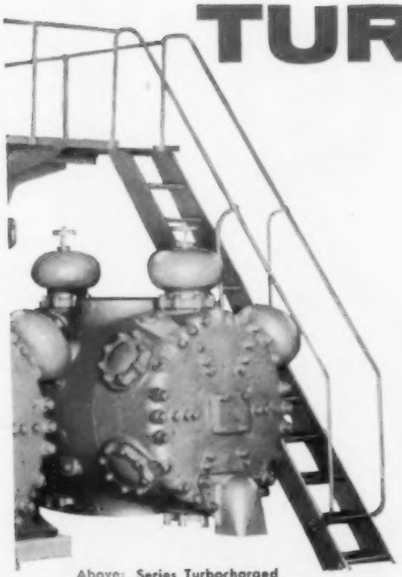
Right: Cross section of Turbocharged GMVC V-Angle available up to 1800 bhp.



with Cooper-Bessemer

SERIES TURBOCHARGED

V-Angle Compressors



Above: **Series Turbocharged GMWC V-Angle rated 3500 bhp at 250 rpm. The largest and most efficient available today.**

Remarkable gains in power output, fuel economy and power-to-space ratio, as important as they are, fail to reveal a key feature of Series Turbocharging. What about performance at start-up and at reduced speeds and loads? Here is one of the underlying factors in Cooper-Bessemer's development of this unique turbocharging system.

With both exhaust-driven and engine-driven turbo compressors operating in series, efficient supercharging is by no means limited to optimum full-load conditions. In fact, *at no time* is supercharging effect completely dependent on exhaust pressure or exhaust heat.

For further details on these and other unusual advantages featured by Series Turbocharged V-Angle Compressors, ask for Bulletin ST-82 . . . or contact the nearest Cooper-Bessemer office.

BRANCH OFFICES: Grove City • New York • Chicago • Washington
San Francisco • Los Angeles • Houston • Dallas • Odessa • Pampa
Gregston • Seattle • Tulsa • St. Louis • Kansas City • Minneapolis
New Orleans • Shreveport

SUBSIDIARIES: Cooper-Bessemer of Canada, Limited . . . . Edmonton
Calgary • Toronto • Halifax.
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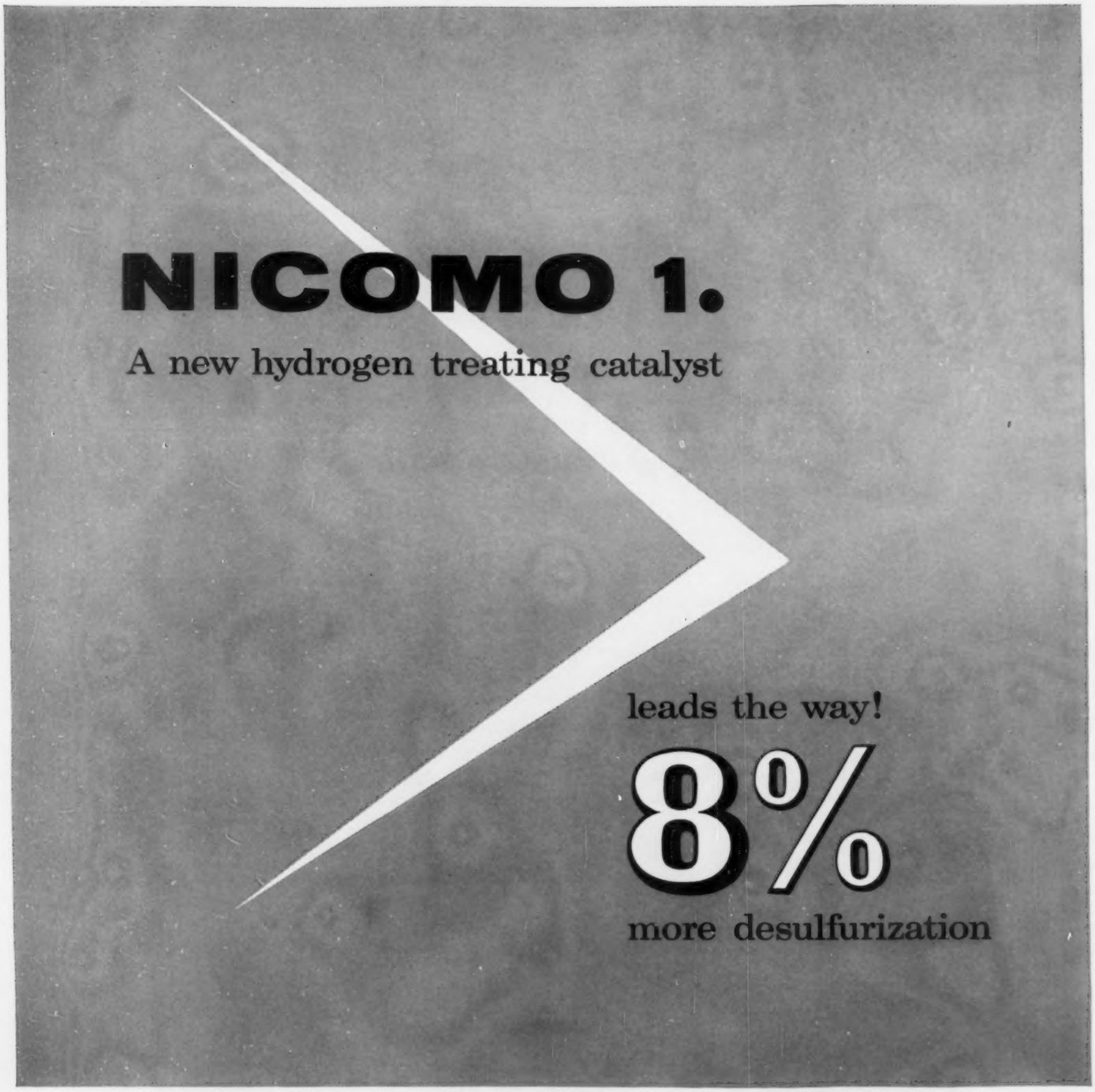
Venezuela • Mexico City.

Cooper/Bessemer

GENERAL OFFICES: MOUNT VERNON, OHIO

ENGINES: GAS • DIESEL • GAS-DIESEL
COMPRESSORS: RECIPROCATING AND CENTRIFUGAL
ENGINE OR MOTOR DRIVEN



No other hydrogen treating catalyst desulfurizes as well as new NICOMO 1. (NICOMO 1. maintains a commercially-proved 8% superiority in desulfurization activity.) No other catalyst offers such a major cost saving. (Because of lower bulk density, you need fewer pounds of NICOMO 1.) Full information in a new booklet. Write on company letterhead for your copy. Or see The Man From Davison.

DAVISON
CHEMICAL COMPANY
Division of W. R. Grace & Co.
Baltimore 3, Maryland

A truckload of pumps going to one customer's waterflood project.

The versatile TP's....

BETHLEHEM'S HIGH-PRESSURE TRIPLEX PUMPS

In waterflooding, salt-water disposal, and many other oil-field pumping operations, nothing outperforms the Bethlehem triplex units. They're rugged, tough, built to withstand unusual punishment. You can count on them for the jobs where continuous, full-load assignments are common.

Complete pumps, ample stocks of parts, and expert field service are obtainable at Bethlehem Supply stores.

These TP features reflect sound engineering:

- **High volumetric efficiency**
- **Direct-flow suction and discharge**
- **Controlled flood lubrication**
- **Extra-large shafts and bearings**
- **Fluid end available in molybdenum alloy iron, cast steel, or aluminum-bronze. Proper trim for each selection**
- **Plungers of hardened steel, stainless steel, or solid ceramic**
- **Optional speed reducer, easily installed in the field**
- **All parts readily accessible**
- **Simple construction throughout**

TP Pumps excel in jobs like these:

Waterflooding • Salt-water disposal • Pumping natural gasoline, refined products, and LPG products • Crude and lean-oil service • Supplying oil to subsurface hydraulic pumping systems

Choose from these three sizes:

Model	Type	Plunger Load, lb	Input hp	Bore and Stroke, in.
TP-3	Triplex	3,580	22 @ 250 rpm*	1¼ to 2¼ x 3
TP-4	Triplex	5,500	46 @ 250 rpm*	2 to 4 x 4
TP-6	Triplex	10,000	100 @ 200 rpm*	2 to 4½ x 6

*For higher ratings, refer to General Offices, Tulsa, Okla.

Need more volume?

Then investigate Bethlehem's U-series pumps:

U-33	Duplex	2,400	11 @ 140 rpm	1¾ to 3 x 3
UA-46	Duplex	5,000	40 @ 120 rpm	2½ to 4 x 6
U-510	Duplex	12,000	100 @ 75 rpm	3 to 5½ x 10

BETHLEHEM SUPPLY COMPANY
General Offices: 21 E. Second St., Tulsa, Okla.
West Coast Headquarters: Los Angeles, Calif.
Canadian Distributor: Bethlehem Supply Company of Canada, Ltd. Calgary, Alberta, Canada
Export Office: Bethlehem Supply Company (Export Division) 25 Broadway, New York, N. Y.

BETHLEHEM SUPPLY

Now!

MID-CONTINENT SUPPLY COMPANY

EXCLUSIVE DISTRIBUTOR WORLD WIDE*

OF DELTA OIL FIELD EQUIPMENT

MANUFACTURED BY

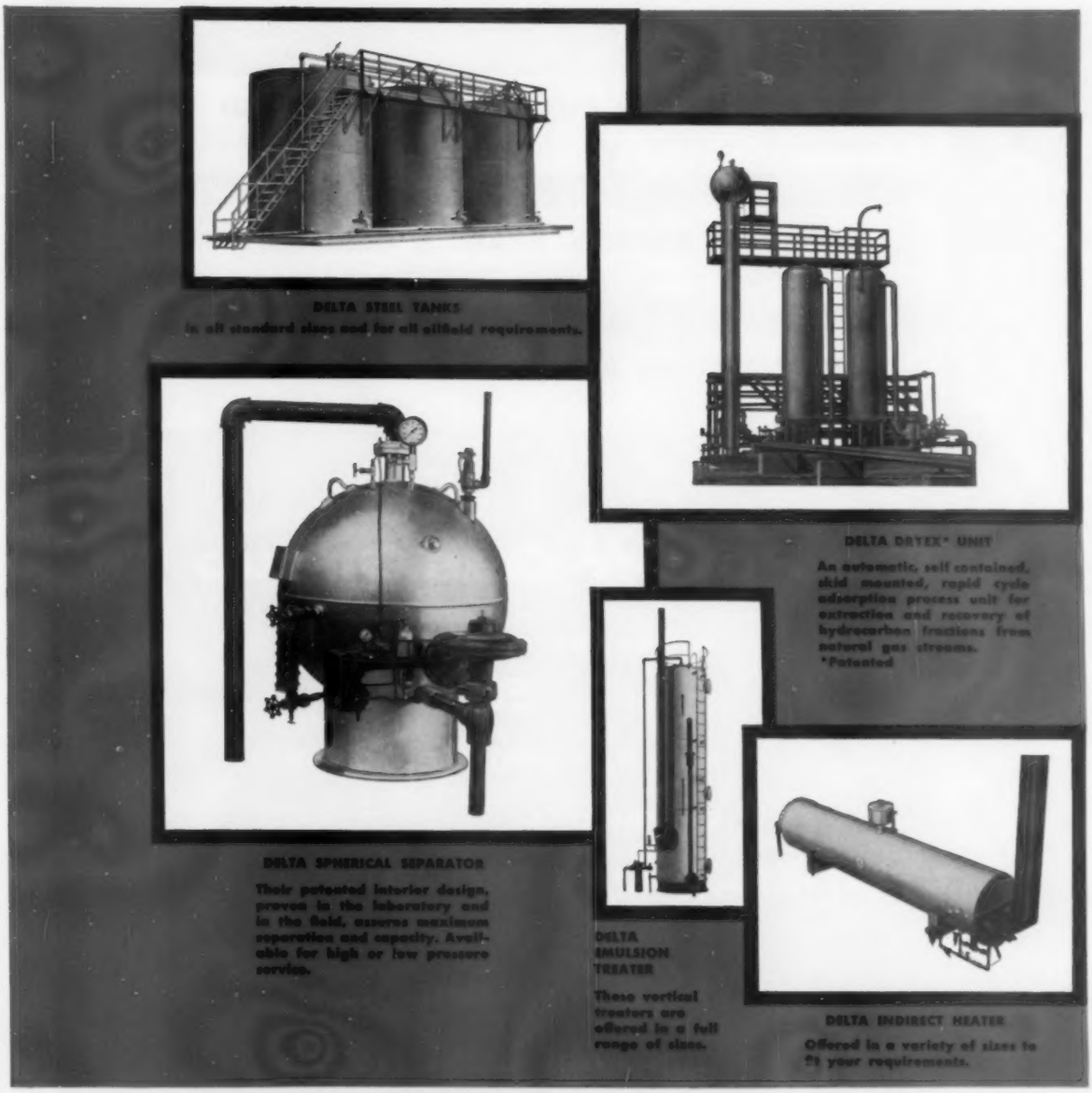
DELTA TANK MFG. CO., INC.

BATON ROUGE, LOUISIANA

*Except in Mexico

MID-CONTINENT DISTRIBUTES THESE DELTA PRODUCTS:

Full line of Steel Tanks (Bolted and Welded), Heaters, Metering Equipment, Spherical, Vertical and Horizontal Separators, Emulsion Treaters, Low Temperature Extraction Units, Dehydration Equipment, Natural Gas Processing Units and other Petroleum Processing Equipment.


DELTA STEEL TANKS
In all standard sizes and for all oilfield requirements.
DELTA DRYEX* UNIT
An automatic, self contained, skid mounted, rapid cycle adsorption process unit for extraction and recovery of hydrocarbon fractions from natural gas streams.
*Patented
DELTA SPHERICAL SEPARATOR
Their patented interior design, proven in the laboratory and in the field, assures maximum separation and capacity. Available for high or low pressure service.
DELTA EMULSION TREATER
These vertical treaters are offered in a full range of sizes.
DELTA INDIRECT HEATER
Offered in a variety of sizes to fit your requirements.

Delta products for the oil field will now be distributed through Mid-Continent's world-wide sales and service facilities. Addition of this top-quality line is another example of Mid-Continent's continuing policy of providing the oil industry with *complete* in-the-field stocks and service. For detailed information about how you can profit from the long life and durability of Delta products, call your local Mid-Continent representative.

MID-CONTINENT SUPPLY COMPANY

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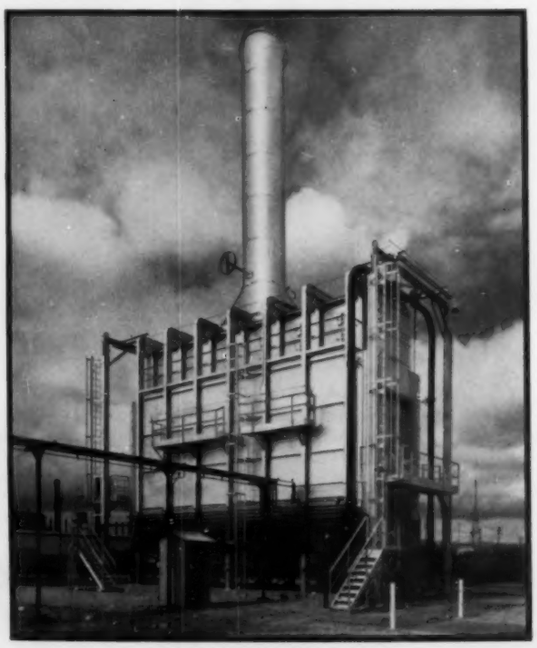

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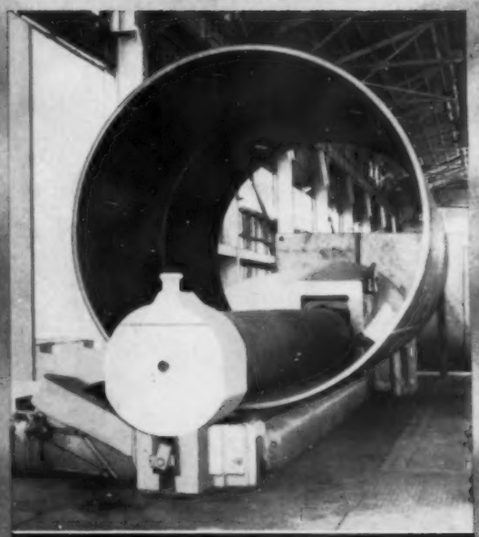

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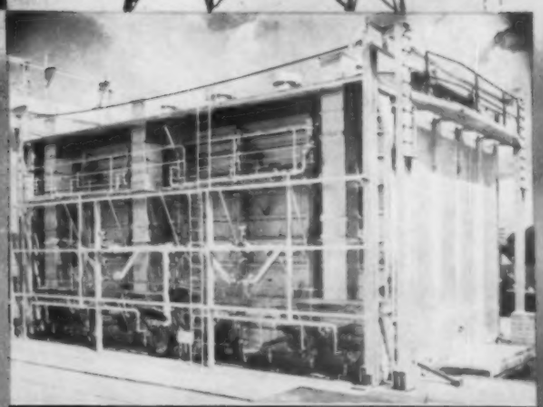

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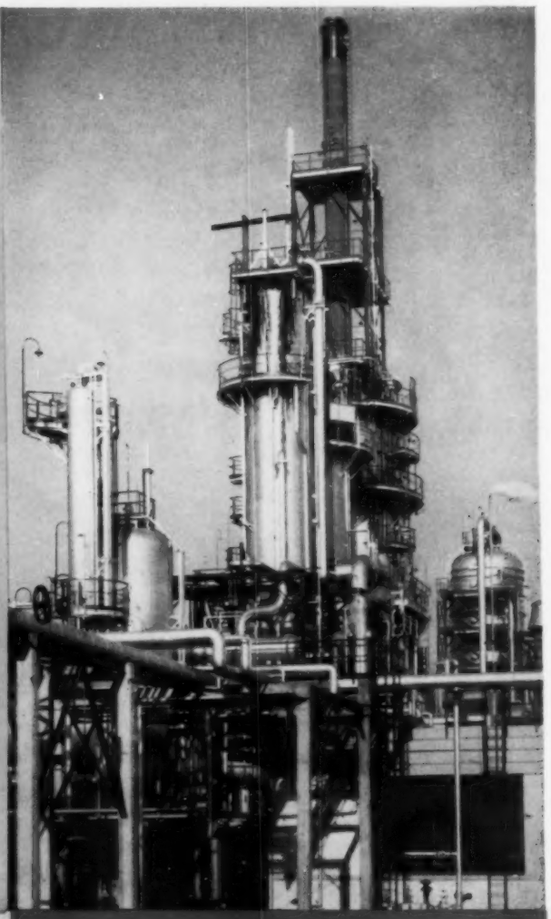

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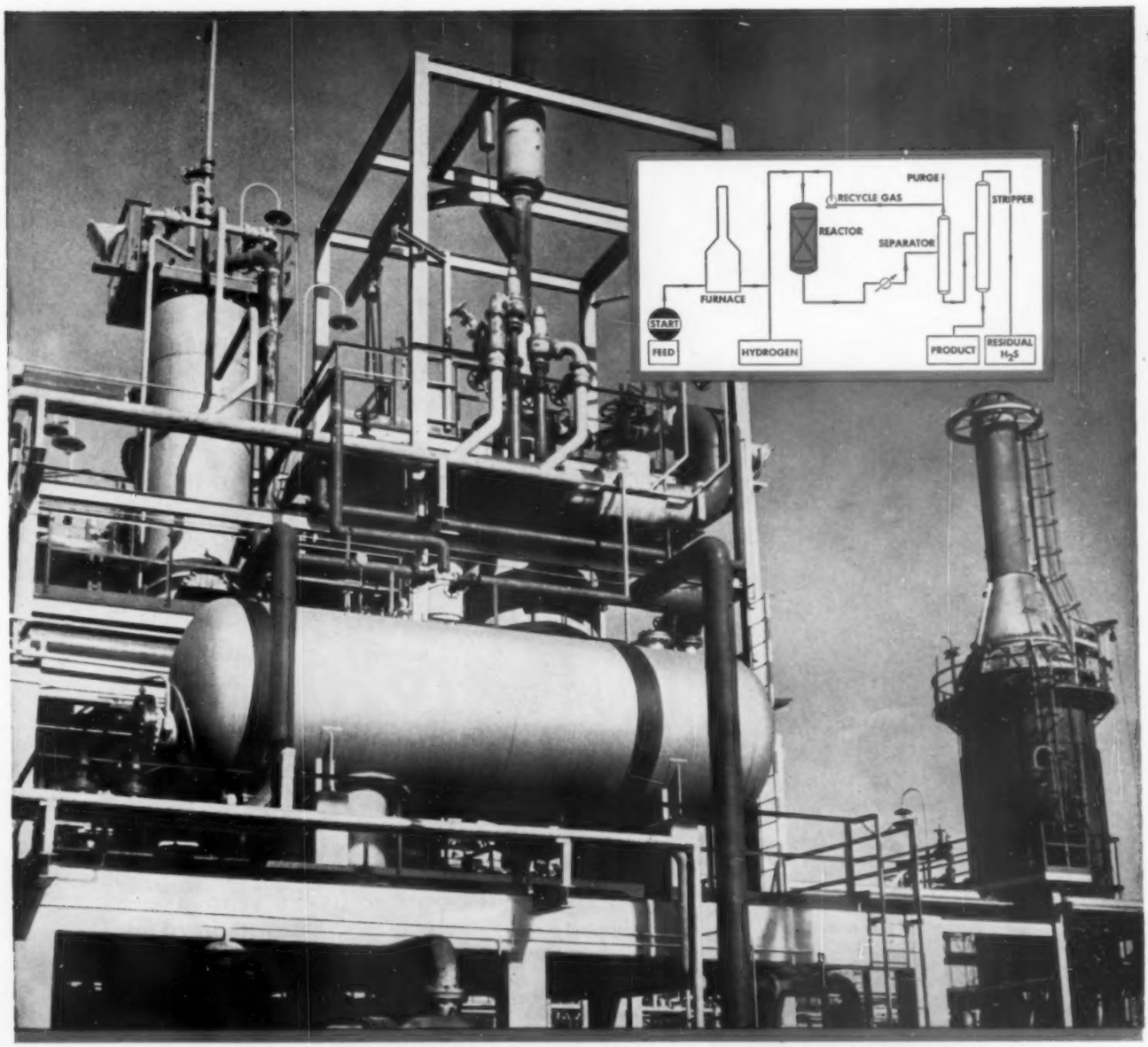

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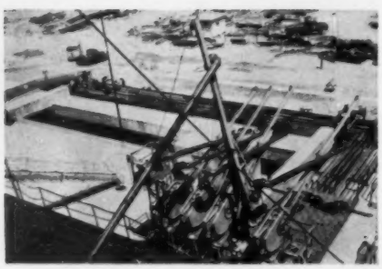

Where once seven men labored 30 minutes to hook up rubber hose, now one man operating hydraulic controls swings a Chiksan Loading Arm aboard, ready for hook up, in less than a minute. There are 96 Chiksan Marine Loading Arms in service throughout the world. Many more are on order.

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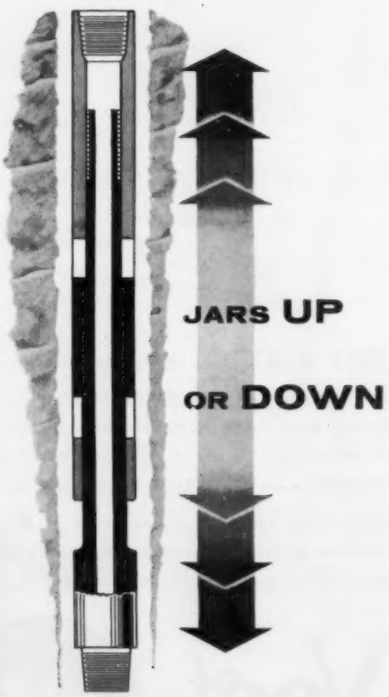

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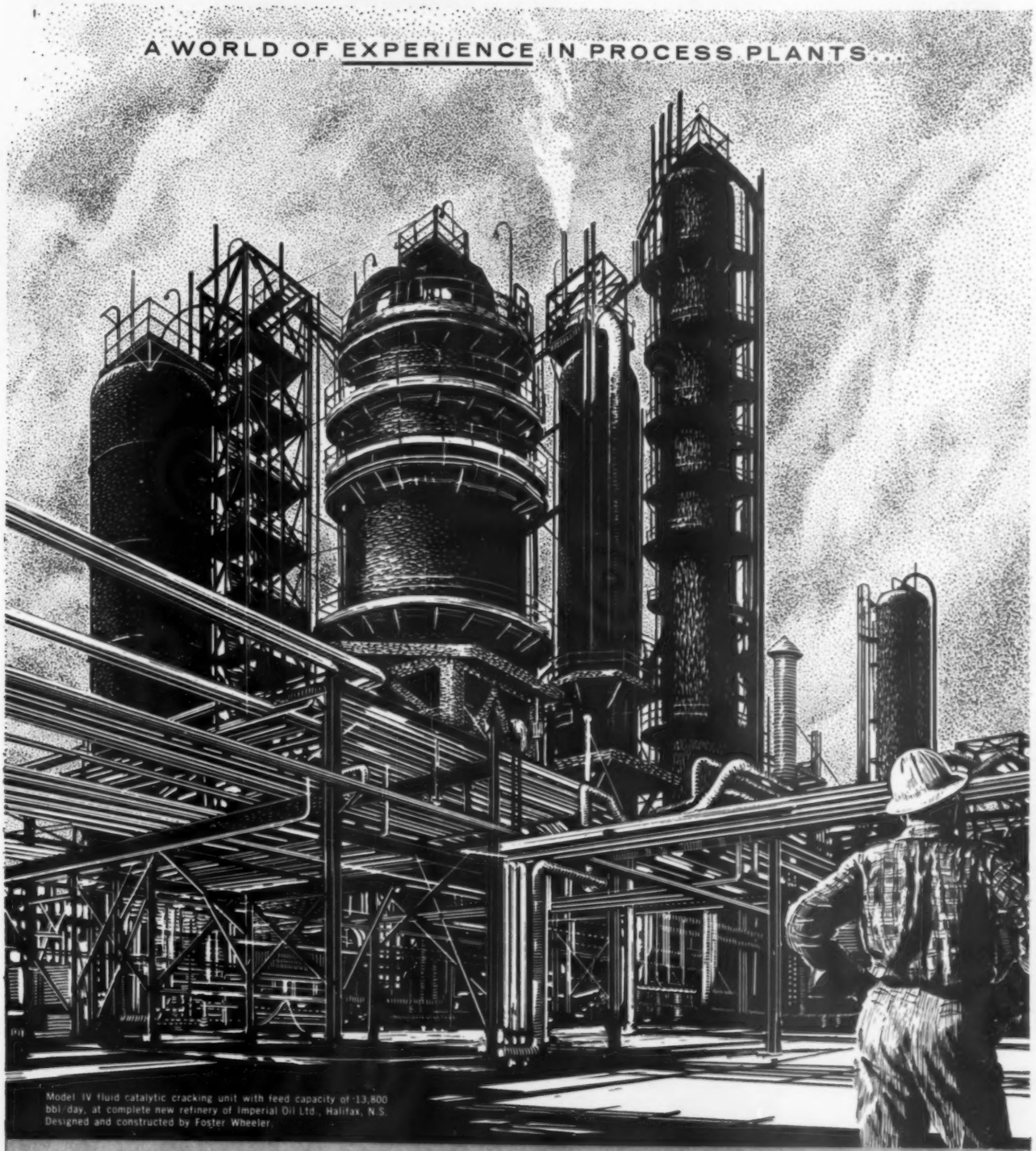

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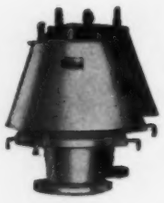

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TYPE "21-E" FLAME ARRESTORS feature semi-steel housings that can withstand long exposure to fire and aluminum or stainless steel "banks." The banks have vertical straight-through passages—and are "extensible" for easy cleaning. 2″ to 12″ sizes.

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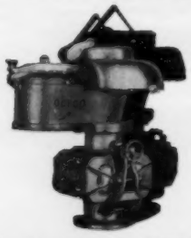
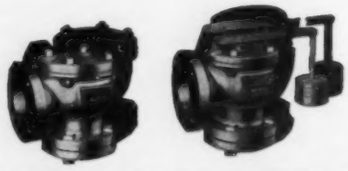


TYPE "BE" VENT UNITS—Combination of an Oceco Type "21-E" Flame Arrestor with either aluminum or stainless steel extensible bank and any of the different types of Oceco Vent Valves. 2″ to 12″ sizes.

4



V-103 VACUUM RELIEF AND V-106 PRESSURE RELIEF VALVES are furnished in 3″ x 3″; 4″ x 4″; and 6″ x 6″ sizes. Vacuum settings from 1½ oz. to 1 lb. per sq. inch. Pressure settings from 2 lbs. to 30 lbs. per sq. inch. Working temperatures up to 500° F.

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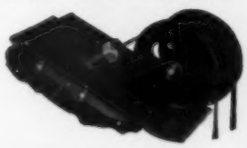

12 **CABLE SHEAVE BRACKETS,** with one outside and two inside sheave wheels mounted on stainless steel axles, bring the cable out at normal angle through a stuffing box minimizing friction.

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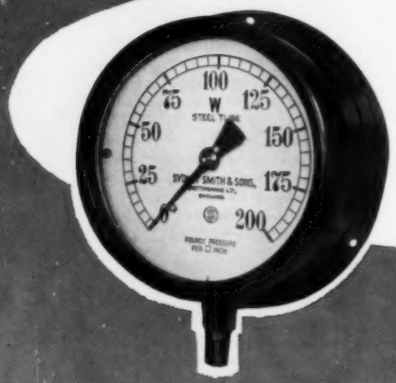

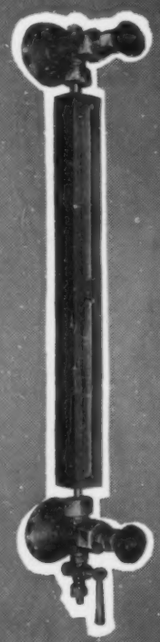

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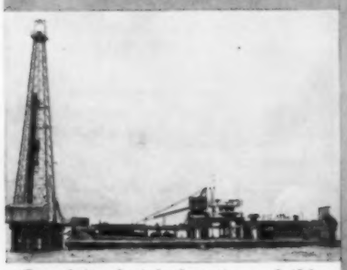

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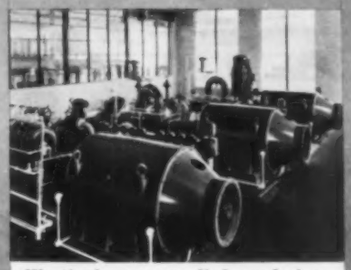

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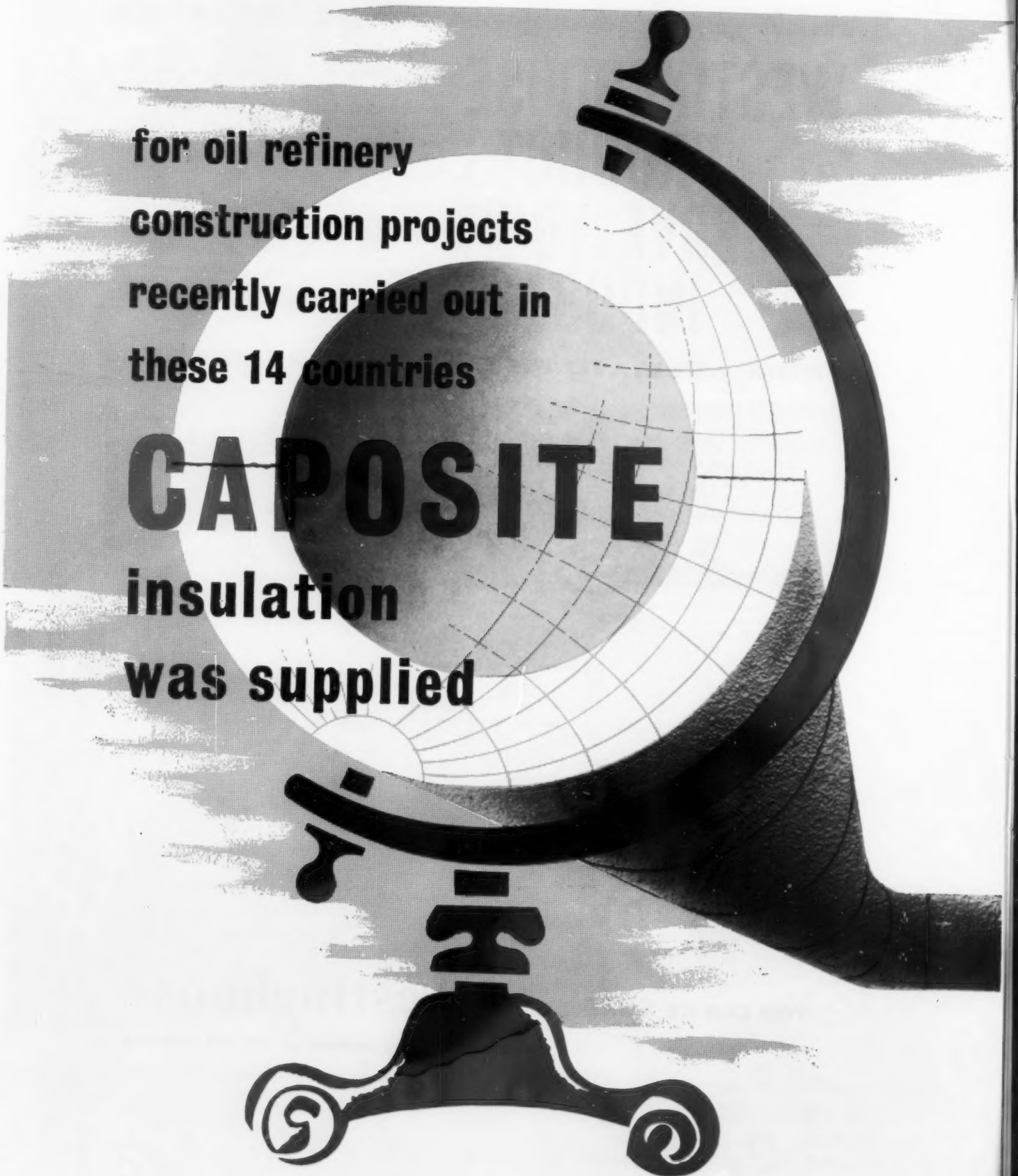
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COLOMBIA *at Cartagena*
for International Petroleum Co. Ltd. Main Contractor: Bechtel Corporation (Insulation Contractor: Harold Aber & Co.)

ECUADOR *at La Libertad*
for the Anglo-Ecuadorian Oil Co. Ltd. Main Contractor: Procon (G. B.) Ltd.

ENGLAND *at Kent Oil Refinery*
for The British Petroleum Co. Ltd.

FRANCE *at Raffinerie de Normândie*
for Compagnie Francais de Raffinage. Main Contractors: Kellogg International Corporation and Foster Wheeler Ltd. (France). (Insulation Contractor: Soc: Technisol).

IRAQ *at Daura, near Baghdad*
for Iraq Government Oil Refinery Administration. Main Contractor: Foster Wheeler Ltd. (London).

ITALY *at Genoa*
for Raffineria Dottore E. Garrone. Main Contractor: C. T. I. P.

KUWAIT *at Akmadi*
for the Kuwait Oil Co. Ltd. Main Contractor: Bechtel-Wimpey and E. B. Badger & Sons Ltd.

THE NETHERLANDS *at Pernis*
for N. V. de Bataafsche Petroleum Maatschappij.

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for Royal Dutch-Shell Group.

SCOTLAND *at Grangemouth*
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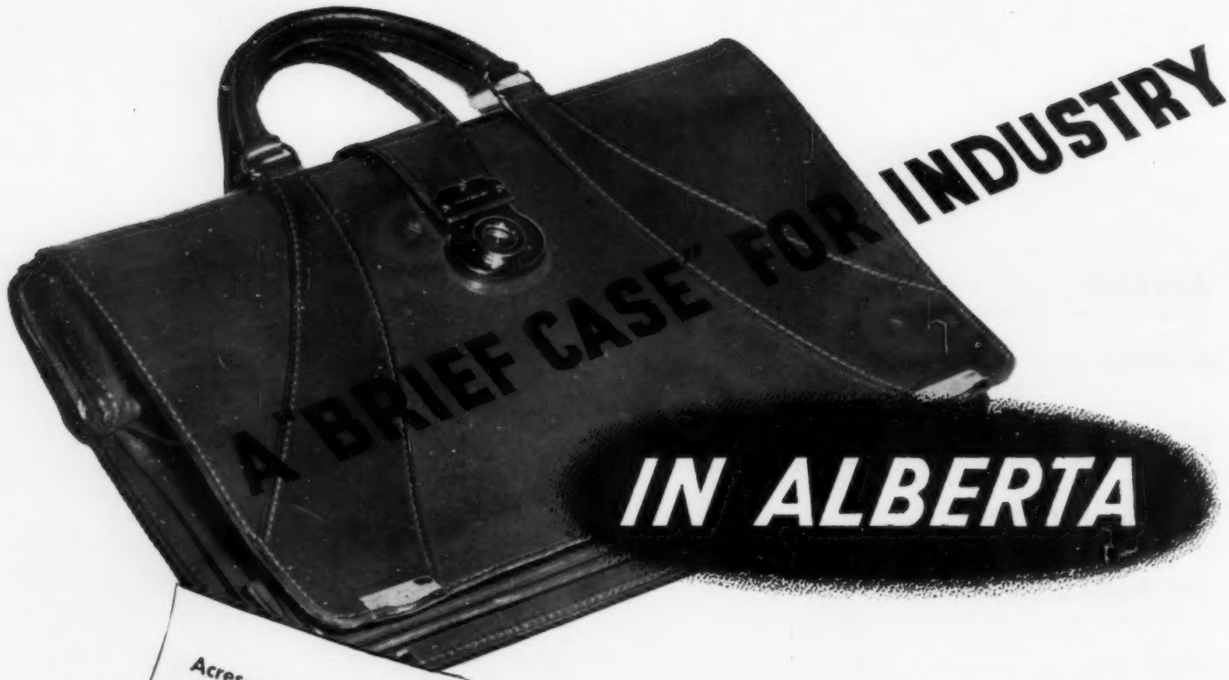

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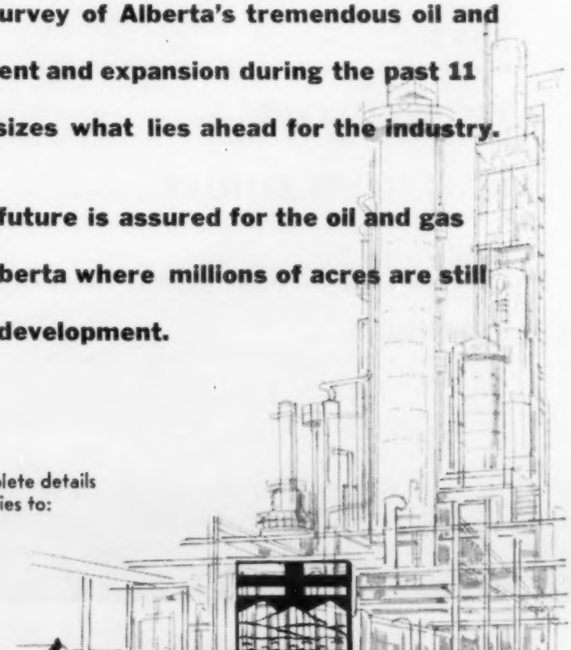

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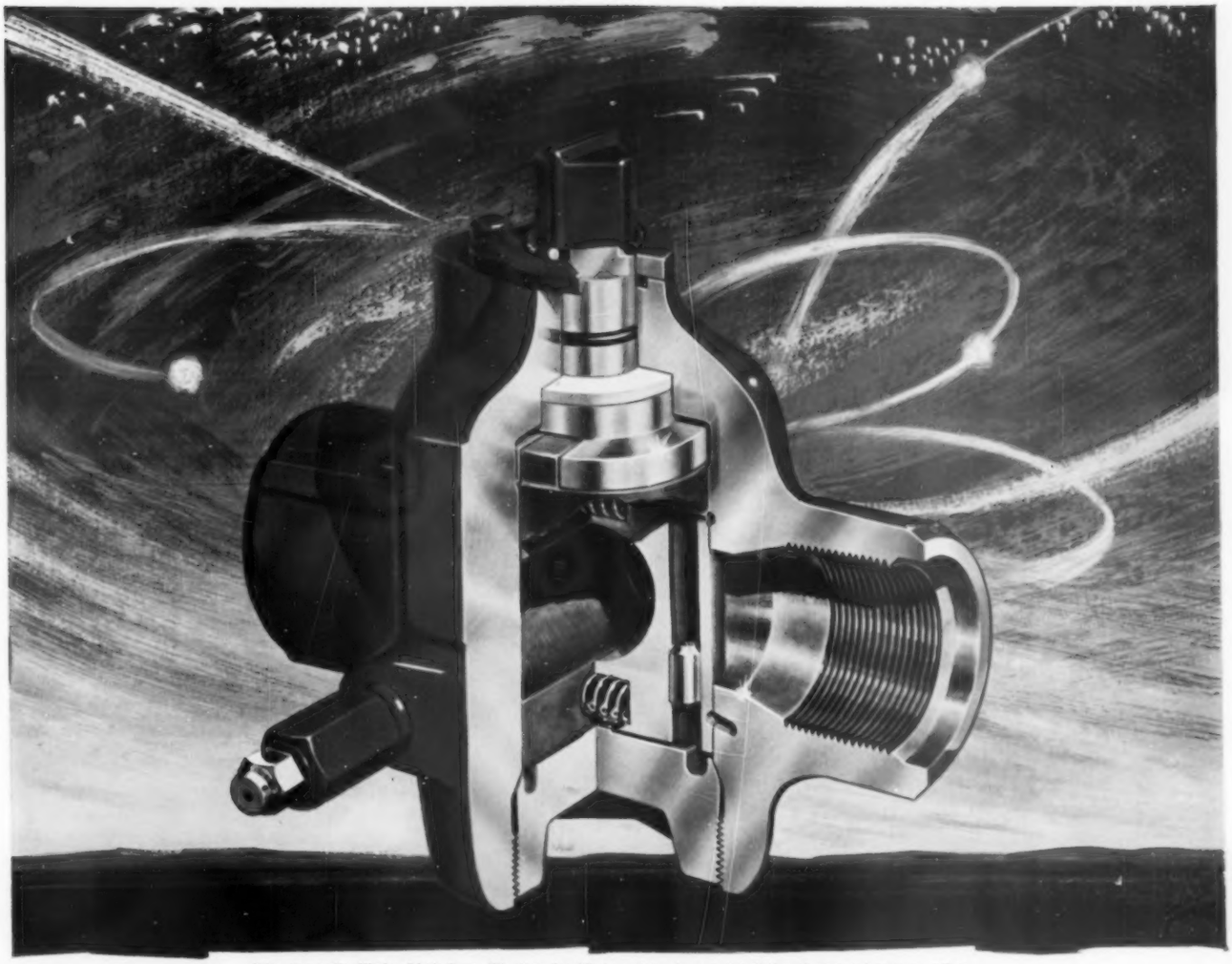
Deputy Minister



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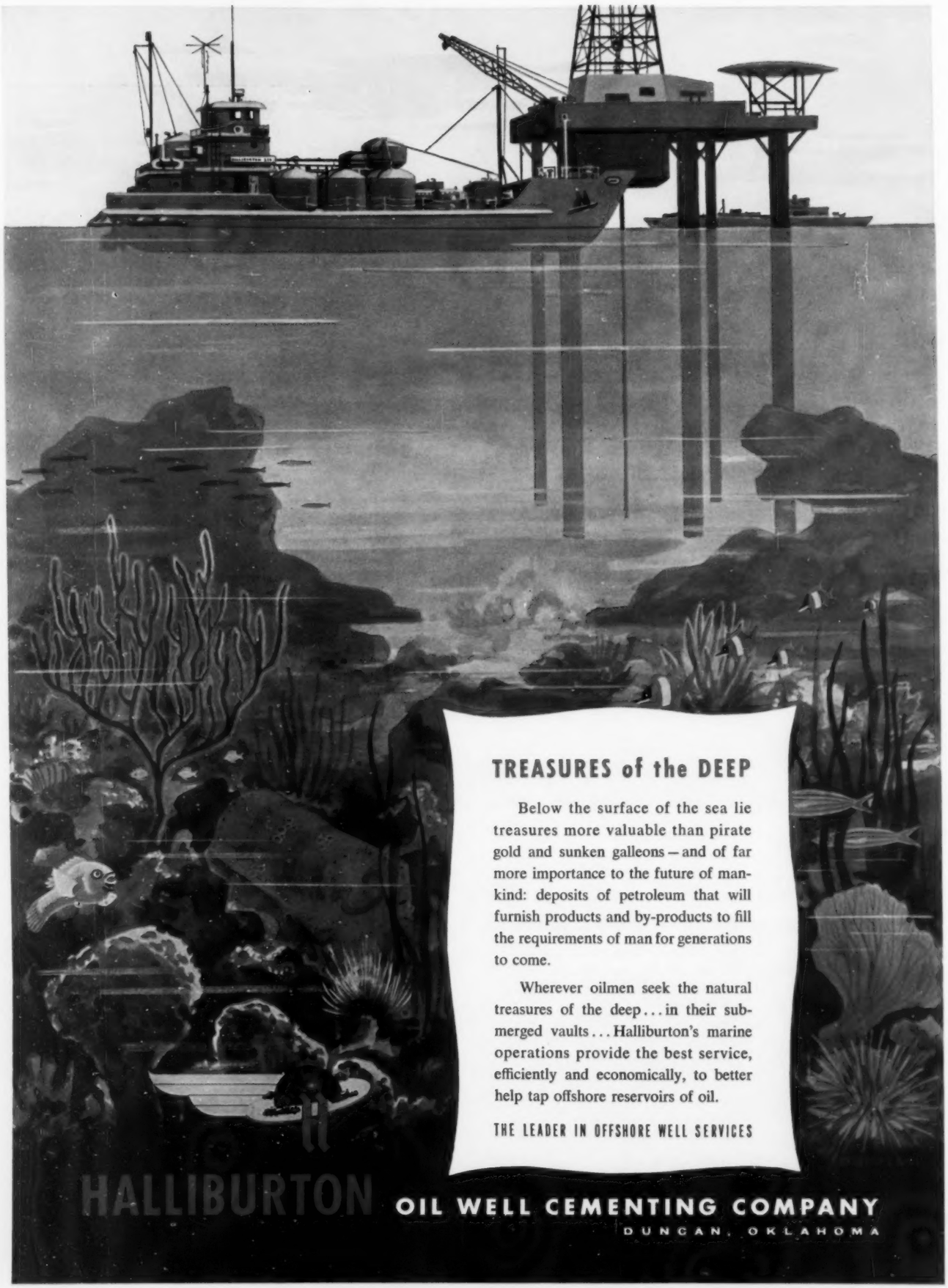
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1958—Year of Decision

by Vernon Taylor

Chairman of the Board of Governors,
Canadian Petroleum Association.
Western Regional Manager, Imperial Oil Limited

CANADA'S young petroleum industry produced more crude oil in 1957 than in any other year in the nation's history. Crude-oil reserves in western Canada were increased during the year, and natural-gas reserves reached an all-time high. Exploration work continued at a high level, and pipeliners added many miles to the country's growing pipeline network.

An important milestone for the industry was reached during the year when two major pipelines moved gas for the first time. Trans-Canada Pipe Line complete the first stage of its construction to Montreal, and delivered Alberta gas to the head of the Great Lakes. Westcoast Transmission Co. Ltd., started gas deliveries in British Columbia and to the USA Pacific Northwest.

In short, 1957 was an extremely active and important year. But there was much more to the story, for the year also produced a series of circumstances which effectively slowed the spectacular growth rate of the decade since Leduc (February 1947) and which overshadow any statistics resulting from the year's operations.

Perplexing problems began to build up for the oil industry about mid-year. By the end of 1957, events and pressures from many sides sharply and adversely influenced Canadian oil operations. These factors now combine to make 1958 a year of decision for the industry.

The Canadian producers' problems can be summarized in a word—markets. There is agreement that new markets for oil and gas are essential to the future well being of the industry. But the problem poses many complex questions: Should there be export of gas or no export; should Canada adopt protective tariffs or import quota systems on crude coming into the country; should western crude be moved across the continent to the big Montreal market? The industry is working diligently toward solution of these problems, and at the same time it continues to work for restoration of USA markets jeopardized by Washington's import restrictions.

Some of the 1957 figures help to spotlight the difficulties. For instance, the daily average production during the year was 498,000 bbl, an increase of 6% over 1956. This compares with an increase of 33% in 1956 over 1955. More significantly, the 1957 production was just about one-half of the industry's productive capacity, which now is about a million barrels daily.

The past year saw total proved liquid hydrocarbon reserves go up 140 million barrels to a year-end figure of 3.259 billion barrels. At the same time, proved natural-gas reserves were estimated at 20.7* trillion cubic feet, an increase of nearly two trillion during the year.

Some of the factors contributing to the current slowdown have been felt continentwide. The slackening of consumer demand for products is common to both Canada and the USA. Gasoline sales fell short of forecasts, and an exceptionally mild winter kept heating-oil sales below normal. As refinery runs lowered, the demand for crude was reduced.

In mid-1957, after the Suez canal had been reopened and tanker rates had declined, markets which Canadian oil had enjoyed earlier in the year—notably part of California—were cut off. When the voluntary import-quota plan became effective in the West Coast area last December, this USA move caused new concern among Canadian producers. While earlier import action involving the area east of the Rockies had little effect on Canadian producers, they viewed the December action as a threat to a "natural" market for their crude.

On the domestic front, one other factor of major importance to the industry developed late in the year. This was the naming by the federal government of a royal commission to study Canada's energy resources and requirements. First hearing of this fact-finding body dealt at length with the natural-gas question, particularly relating to export possibilities. The commission's recommendations on this matter will have a profound effect on future gas exploration and development programs in western Canada.

But despite the complexity of these problems, the industry faced 1958 with optimism. It is recognized that solutions will not come easily, and a return to full-scale exploration and development activity will take time. But the industry itself is making every effort to overcome its difficulties, and much now depends on action and decision at the highest levels of authority, both at home in Canada and in the USA.

*Estimate of 23.6 trillion cubic feet in 1957 report included some probable reserves.

A Cree Indian and his team of huskies help this gravimeter survey.

CANADA —an expanding economy

Oil consumption in Canada rose 6% in 1957, crude production and refinery activity over 7%. Drilling was depressed following a cut in export crude demand.

by E. S. Graham and E. C. Sievwright

THE year 1957 for the Canadian petroleum industry came in like a lion and went out like a lamb—to be sure, a healthy lamb. The early months of the year inherited an exuberant carryover from 1956, both in domestic and export markets; and, when the rates of demand increase slowed down in the second half of the year, it was not surprising that the general tempo of the industry should slacken. It was this coincidence of domestic and foreign factors in 1956 which led to the high levels from which the industry retreated by mid-1957. At home, the year 1956 saw the peak of a capital-investment boom unparalleled in Canadian history, which brought with it record levels of demand for petroleum products. Some of the buoyancy of this boom spilled over into the first half of 1957, and total capital investment for the year will be only 3% below the record 1956 level—but 1957 is generally regarded as a period of adjustment and consolidation.

This same period, mid-1956 to mid-1957, exposed the Canadian oil industry to the chill winds of international petroleum economics. The abnormally high tanker rates caused by the Suez disturbance enabled Canadian producers to make substantial offshore shipments to California—reaching a peak of 56,000 b/d in May, and declining to 3,000 b/d by July. After July, no further movements were made, as more normal tanker rates returned after the Suez settlement. Thus in 1957, some 10 years after the Leduc discovery, Canadian producers of crude oil became of age, in that they were exposed for the first time directly to the vagaries of international petroleum supply and demand. By mid-1957, both of these boom factors had disappeared, leaving the industry to face a period of consolidation and preparation for the return of the normal growth pattern.

Crude Production: Production of crude oil in 1957 increased by 7.2% over the 1956 level—reaching an average rate of 504,000 b/d. Alberta supplied 383,000 b/d, Saskatchewan 100,000 b/d, and Manitoba 17,000 b/d; while British Columbia began commercial production during the year with an average of approximately 1,000 b/d. The peak production rate was 543,000 b/d in January, when offshore shipments to California averaged 34,000 b/d. The lowest production month was November—averaging 408,000 b/d; and, by December, the volume had recovered to an estimated 430,000 b/d. Table I shows the disposition of Canadian crude production and imports of foreign oil in 1957.

Alberta production was down 2.5% from 1956, while Saskatchewan output increased by 78.6% as the province's 3,000th producing oil well was completed (Table II). This was the first time since the Leduc discovery that Alberta production had failed to register an increase over the previous year.

Exports from Canada to the USA totaled 152,000 b/d, of which Saskatchewan contributed 33,000 b/d, compared to 19,000 b/d in 1956. Thus, Alberta—faced with the uncertainty of export markets to the West—is now confronted with the challenge of expanding Saskatchewan production which enjoys a substantial geographical advantage for eastern Canadian and USA Mid-Continent markets.

The Interprovincial pipeline extension to the Toronto area was completed in September, with initial capacity of 110,000 b/d serving refining capacity of 80,000 b/d. This is one of the most rapidly growing areas in Canada; and, as refining capacity is built up, Canadian crude should be able to back out some of the foreign crude imported and refined at Montreal and moved into the Toronto-Hamilton area by product pipeline. Total imports of crude into eastern Canada in 1957 amounted to 307,000 b/d, of which 245,000 b/d came from Venezuela and the Caribbean, 38,000 b/d from the Middle East,

E. S. GRAHAM, manager of the economics and planning department of Shell Oil Co. of Canada, joined the company in 1935 after 17 years' experience in the oil industry in Canada and the United States. He held various marketing appointments in eastern Canada, including assistant division manager. In 1952, Mr. Graham was appointed manager of the head office, economics and planning department.

E. C. SIEVWRIGHT, assistant to the vice president in charge of transportation and supplies for Shell Oil Co. of Canada, is a graduate of London University (B.Sc. in economics) and McGill University (M.A.). He joined Shell in 1953 as technical assistant; and was appointed assistant manager of the head office, economics and planning department, in 1957. Early this year, he was named assistant to the vice president, transportation and supplies.

TABLE II
CRUDE PRODUCTION
(Thousands of Barrels Per Day)

Year	Alberta	Saskatchewan	Manitoba	Other[2]	Total
1951	126	3	—	1	130
1952	161	5	—	1	167
1953	211	8	2	1	222
1954	241	15	6	1	263
1955	311	31	12	1	355
1956	393	58	16	3	470
1957[1]	383	100	16	5	504

[1] Partly estimated.
[2] Includes B.C., Northwest Territories, and eastern Canada.

TABLE III
CRUDE PRODUCTION—
% DISTRIBUTION

Year	Alberta	Saskatchewan	Manitoba	Other[1]
1951	96.9	2.3	—	0.8
1952	96.4	3.0	—	0.6
1953	95.0	3.6	1.0	0.5
1954	91.6	5.7	2.3	0.4
1955	87.6	8.7	3.4	0.3
1956	84.2	12.0	3.4	0.4
1957[2]	76.0	19.8	3.2	1.0

[1] Includes eastern Canada, Northwest Territories, and British Columbia.
[2] Partly estimated.

TABLE VI
WESTERN CANADA DISCOVERIES—1956-1957

	Oil		Gas		Total	
	1956	1957	1956	1957	1956	1957
Alberta	53	51	49	37	102	88
Saskatchewan	59	34	1	4	60	38
Manitoba	3	4	—	—	3	4
British Columbia	—	11	7	4	7	15
Total	115	100	57	45	172	145

TABLE VII
REFINING CAPACITY
(Thousands of Barrels Per Day)

Year	British Columbia	Prairies	Eastern Canada	Total
1951	29	121	261	411
1952	30	130	288	448
1953	46	145	318	509
1954	54	161	350	565
1955	64	176	406	646
1956	71	188	449	708
1957[1]	71	195	512	778

[1] Partly estimated.

and 24,000 b/d from the USA. The total was up 5.1% from the 1956 figure.

Table III shows how Saskatchewan production has increased over the past few years to account for nearly 20% of the Canadian total in 1957. The gain has been at the expense of Alberta, whose share has been declining since 1951—although at a modest rate until last year. Increasing production potential, lack of rigid proration regulations, and geographical advantage in serving eastern Canadian and USA Mid-Continent markets all help to explain the rapidly growing Saskatchewan production.

Drilling activity in western Canada, as measured by the average number of rigs at work, accurately reflected the slowdown in demand for Canadian crude oil during 1957 (Table IV). Development drilling, the more sensitive indicator of current market conditions, was down 18.9% below 1956; while exploration drilling recorded a modest 3.0% gain. The changing emphasis between Alberta and Saskatchewan was also reflected in the drilling figures. In Alberta, development drilling was off 27.6%, while exploration work showed only a 3.2% loss. In Saskatchewan—with new markets opening up—development drilling was ahead 4.8%, while the number of exploration rigs on the average was 17.4% down from 1956. The average number of geophysical survey parties in the field was down 11.7% in Alberta, and up 5.0% in Saskatchewan. In other areas of western Canada—principally British Columbia—the average number of development drilling crews was 23.1% below 1956, while exploration crews were up 69.2%.

Total well completions were down 9.5% from 1956, with Alberta showing a 24.3% decline and Manitoba 10.0% (Table V). Saskatchewan completions were up 10.3% over the previous year. Gas-well completions, mostly in Alberta, were up 10.3%; while oil-well completions were down by 21.6%. All provinces showed less favorable success ratios in 1957 over 1956, as dry holes accounted for 29.5% of all completions, compared with 21.9% in 1956 (Table VI). The busiest drilling area in Canada was the Pembina field in the Alberta foothills, where 395 wells were completed. Much of the increased activity in Saskatchewan was centered in the Steelman area, with some 241 completions.

Refinery Operations: Crude runs by Canadian refineries in 1957 amounted to 680,000 b/d, an increase of 7.3% over the previous year. Canadian crude supplied 350,000 b/d, or 52%, with the balance being imported from the Caribbean, the Middle East, and the USA into eastern Canada. Crude-handling capacity was increased by 70,000 b/d during the year to reach a total of 778,000 b/d by year-end (Table VII). Most of this new capacity was added in eastern Canada, with Ontario accounting for 50,000 b/d and Montreal 13,000 b/d. The emergence of the Toronto area as a major refining center was emphasized by the construction of over 40,000 b/d of capacity during 1957. Once again, catalyic reforming dominated the specialist units added—continuing the trend begun in 1954 (Table VIII).

TABLE VIII
DEVELOPMENT OF CATALYTIC REFORMING IN CANADIAN REFINERIES[1]

Year	Crude Intake Capacity	Catalytic Reforming Capacity	Catalytic Reforming as a % of Crude Capacity
	(Thousands of Barrels Per Day)		
1953	509	4	0.8
1954	565	21	4.0
1955	646	40	6.2
1956	710	79	11.1
1957	778	122	15.7

[1] Estimated at year end.

Largely responsible for rapid development of catalytic reforming was the continued improvement in motor-gasoline quality throughout Canada (Table IX). By year-end, the weighted average RON for premium had reached 97.9, and for regular grade 90.9—both showing substantial increases from the previous year.

TABLE IX
CANADIAN MOTOR-GASOLINE QUALITY IMPROVEMENT 1955-1957

Year	Research Octane Numbers Regular	Premium
1955	87.4	94.1
1956	89.5	95.6
1957	90.9	97.9

(Source: Ethyl Corp. of Canada Ltd.)

Product Demand: Demand for all petroleum products in Canada increased by nearly 6.0%, to a record level of 759,000 b/d (Table XII). Motor gasolines gained by 5.6%, and middle distillates increased by about 8.0%; while consumption of heavy fuel oils remained about 1.8% above the 1956 level—in line with the general tempo of industrial activity. Motor-vehicle sales were 8% below the 1956 volume, but still

TABLE I
DISPOSITION OF CANADIAN CRUDE OIL PRODUCTION[1]—1957
(Thousands of Barrels Per Day)

Origin	Destination B.C. & N.W.T.	U.S. Pac. N.W.	U.S. California	Prairie Provinces	U.S. Mid-Continent	Ontario	Totals
Alberta	61	74	19	118	17	94	383
British Columbia and N.W.T.	2	—	—	—	—	—	2
Saskatchewan	—	—	—	29	33	38	100
Manitoba	—	—	—	1	9	7	17
Eastern Canada	—	—	—	—	—	2	2
	63	74	19	148	59	141	504

[1] Partly estimated.

TABLE IV
DRILLING ACTIVITY IN WESTERN CANADA—1956 AND 1957

	Average Monthly Number of Rigs in the Field: Development Drilling		Exploration Drilling		Total		Geophysical Survey Parties	
	1956	1957	1956	1957	1956	1957	1956	1957
Alberta	105	76	64	62	169	138	86	76
Saskatchewan	41	43	23	19	64	62	20	21
Other areas	13	10	13	22	26	32	18	13
Total	159	129	100	103	259	232	124	110

TABLE V
WELL COMPLETIONS IN WESTERN CANADA—1956 AND 1957

	Oil		Gas		Dry		Total	
	1956	1957	1956	1957	1956	1957	1956	1957
Alberta	1,368	877	138	137	352	412	1,858	1,426
Saskatchewan	791	853	11	18	291	334	1,093	1,205
Manitoba	195	135	—	—	56	91	251	226
British Columbia	6	10	35	48	15	34	56	92
Total	2,360	1,875	184	203	714	871	3,258	2,949

well above the average of the past five years. A total of 455,000 vehicles was sold —bringing motor-vehicle registrations in Canada up to 4.4 million, of which approximately 3.4 million were passenger cars. With one vehicle for every 3.6 persons and a passenger car for every five persons, the 5.2 million licensed Canadian drivers drove 40 billion miles in 1957. The dieselization of Canadian railroads progressed during 1957, and by year-end there were more than 2,250 diesel units in operation. It is expected that the conversion program will be completed by 1961.

Residential construction was lower in 1957 than in either of the preceding two years—with an estimated 120,000 new starts being reported, compared with 126,000 in 1956. House-building activity was at a relatively low level in the first half of the year due to the modest carryover from 1956, but credit liberation by the federal government brought a substantial recovery in the last quarter. Despite the slowdown in this field, the number of oil-heated dwellings increased by about 10% during the year—bringing the total to approximately 2.1 million by year-end. Conversion of coal furnaces to oil is becoming a less significant factor in this market, and natural gas is beginning to claim a substantial share of new construction installations. For example, during 1957, in the metropolitan Toronto area, approximately 75% of all new single-family dwellings installed natural-gas heating. Thus, it would seem that the extremely rapid growth of distillate demand in the postwar decade might slow down somewhat in the next few years.

Aviation products recorded a 3% gain over 1956—with aviation-turbine fuels moving ahead by 10.0%, and aviation-gasoline consumption declining by about 8.0%. During the year, the gap between these fuels was narrowed further, as turbine-type accounted for 3.5 million barrels, and gasoline for 3.6 million barrels (Table X).

TABLE X
AVIATION-FUEL CONSUMPTION IN CANADA 1952-1957
(Millions of Barrels)

Year	Gasoline	Turbine Fuel
1952	2,533	427
1953	2,726	992
1954	2,676	1,613
1955	3,555	2,346
1956	3,907	3,163
1957[1]	3,600	3,500

[1] Estimated.

Pipelines: Pipeline construction was one of the brighter spots of the year. Some 2,200 miles of major line were laid during 1957, plus 650 miles of looping and about 2,300 miles of gas-distribution line—making a total of over 5,000 miles. The present total oil-and-gas line mileage in Canada is 9,000 miles, compared with 435 miles 10 years ago, before the Leduc discovery. Natural-gas lines accounted for most of the mileage in 1957. In British Columbia, the Westcoast Transmission Co. Ltd. completed its 649-mile 30-in. line from the Peace River district to Vancouver. The initial volume of 150 mmcf per day built up to 300 mmcf per day by year-end—with substantial export volumes being shipped to the Pacific Northwest states. Construction of the Trans-Canada pipeline proceeded on schedule, with completion of the 34-in. main line from the Alberta border to Winnipeg and the first 30-in. section east from that city. In eastern Canada, the company' line from Toronto to Montreal was pushed forward towards completion and, by year-end, 60% of the entire Trans-Canada system was in the ground. The remaining 1,011 miles of main line is scheduled for completion by the fall of 1958.

The 156-mile extension of the Interprovincial line from Sarnia to the Toronto area was the most significant crude-line development of the year. This 26-in. line has an initial capacity of 110,000 b/d, and serves directly an area which promises to become one of Canada's major refining centres.

Outlook: Following an election campaign promise, the new federal government of Canada, in October, appointed a royal commission to consider energy resources in Canada. The wide scope of the inquiry is suggested in the first of the terms of reference which states, ". . . the policies which will best serve the national interest in relation to the export of energy and sources of energy from Canada." This is the first time in Canada that all forms of energy have been brought under one heading in terms of government policy. With the principal objective of the inquiry being to insure that domestic needs are fully looked after before export permits are issued, the establishment of the commission has launched a cloud of uncertainty over several natural-gas export schemes. The commission initially stated that no preliminary reports covering individual permits would be made, but subsequent developments indicate that an interim statement on natural gas may be issued. Despite these new uncertainties—judging by capital expenditures —Canadian oil men are looking ahead with confident optimism.

TABLE XI
CAPITAL EXPENDITURES BY THE CANADIAN OIL INDUSTRY
(Millions of Dollars)

	1956	1957 (Preliminary)	1958 (Estimated)
Extraction	256	231	230
Refining	102	95	109
Transportation and distribution	190	332	242
Marketing	68	83	91
Total	616	741	672

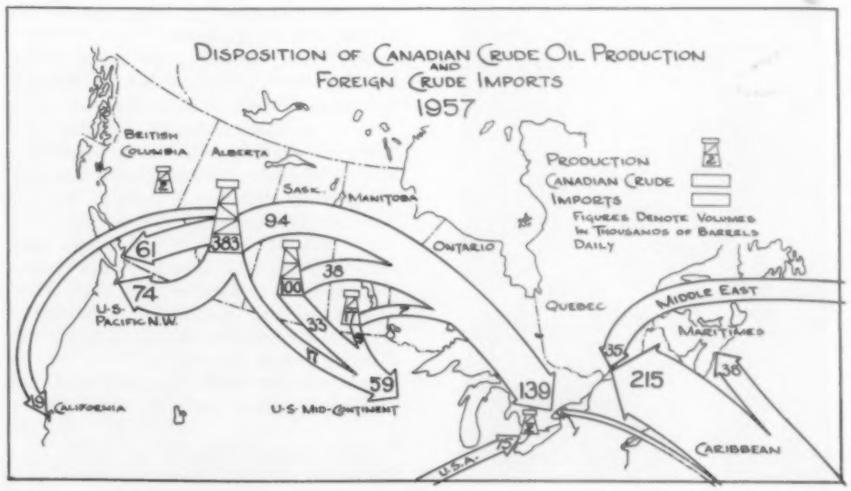
1957, capital outlays were abnormally high due to the exceptional pipeline construction program; and, consequently, the 1958 total will probably fall short of the 1957 figure (Table XI). But, after allowing for this factor, 1958 expenditures should be ahead of the previous year.

The industry is not too concerned about the leveling-off in the past year. The Canadian market is one of the most dynamic in the world, and expert opinion looks for a doubling of demand over the next 10 years. The petroleum resources of the nation have only been scratched so far, and there remains an immense job for seismic and geophysical crews—followed by wildcat and development drillers. And Canada has an established pipeline system which is without equal when one considers that it is only 10 years since the first major crude-oil discovery. With this future ahead, Canadian oil men tightened their belts a notch in 1957, but their confidence in the long-run growth of the industry is unchanged. END

TABLE XII
CANADIAN SUPPLY AND DEMAND FOR OIL
(Thousands of Barrels Per Day)

	1956	1957[1]
Crude production	469	504
Natural-gas liquids	13	13
Total domestic supply	482	517
Crude imports	293	304
Product imports	98	100
Total imports	391	404
Total new supply	873	921
Crude exports	116	152
Product exports	6	6
Total exports	122	158
Domestic demand	721	759
Inventory change	+30	+4

[1] Partly estimated.



Innisfail—1957's top reef discovery

Canadian Oil Companies Ltd. Innisfail D-3 is the first discovery in four years of a major reef field. It culminates a recent integration by Canada's largest Canadian-owned company.

by W. M. Luthy

THE 1947 Devonian reef discovery at Leduc, which touched off the now famous oil boom in Canada, was followed by other major reef discoveries in successive years. These discoveries at Redwater, Golden Spike, Acheson, and Wizard Lake were climaxed in 1952 by the finding of three reef fields, Bonnie Glen, Sturgeon Lake, and Westrose.

Four lean years followed without a major reef discovery until, in 1957, Canadian Oil Companies Ltd. found the reef oil-bearing at its White Rose-C.&E. Innisfail 1-16 well, six miles southwest of the town of Innisfail, midway between Calgary and Edmonton.

W. M. LUTHY is development manager for the producing department of Canadian Oil Companies Ltd. A graduate of Ohio University, he has been active in the exploration and producing, pipeline, and crude-oil purchasing phases of the industry since 1935. He became associated with Canadian Oil in 1955, just prior to its entrance into exploration in western Canada.

The Leduc (D-3) reef formation of Devonian age has proved to be the outstanding source of Alberta's 3.9 billion barrels of virgin oil and condensate,[1] accounting for more than 55% of the reserves. The Niksu (D-2) formation of the same age has contributed an additional 9%, mostly from the Leduc-Woodbend and Fenn-Big Valley fields.

The Cardium formation of the Colorado group has contributed the second largest number of barrels, or 22%—with almost all of it being from the widespread Pembina field. A poor third is the Rundle formation of Mississippian age, with 8%—again contributed mostly by one field, Harmatton-Elkton. The famed Turner Valley field, at one time the British Empires' largest and for many years Canada's only major oil field, also produces from the Rundle, but is now nearing depletion.

The Viking group, of the lower Cretaceous period, has contributed less than 3% —with the consolidated Joarcam field being the only substantial discovery in this zone. Although production has been found in a number of other formations, none has contributed significantly—at least to date—to Alberta's ever-growing reserve picture.

The Innisfail discovery, then, not only revived interest in Alberta's most prolific formation, but its location, well to the south of previous reef discoveries, substantially enlarged the possible search area for this superior source of reserves.

Development of the Innisfail field has been rapid, with as many as 12 rigs drilling simultaneously. At the end of nine months, 34 wells had been successfully completed. Although the field is not yet fully defined, it appears it may cover an area three miles wide and up to six long, or about 8,000 to 9,000 acres. As the field is being drilled on 80-acre spacing, it could ultimately have between 80 and 100 wells, when fully developed.

Oil-water contact was found at 5,492 ft below sea level, while oil-gas contact was determined to be 5,345 ft subsea—giving a maximum pay section of 147 ft. Located 35 miles east of the foothills limits of the Canadian Rockies, average elevation of the field is about 3,000 ft—requiring 8,300 ft to 8,600 ft of drilling to reach the pay zone. A small gas cap covers about 1,000 acres of this area, ranging up to 40 ft in thickness.

Using a conservative estimate of 100 bbl of recoverable reserves per acre-foot, the field could have in excess of 50,000,000 bbl of recoverable reserves, which would rank it ninth among D-3 discoveries to date in Alberta.

Porosity of the reef ranges from 4% to as high as 20%, averaging about 6%, with a wide range of permeabilities. Connate water is estimated at 15%. Shrinkage is substantial due to high gas saturation and bottom-hole pressure which reaches 3,600 psi. It is expected that recovery mechanism will be a strong water drive combined with an expanding gas-cap drive, which should result in an extremely high percentage recovery of oil in place.

The crude oil has a gravity of 44 API, and contains approximately 0.4% sulfur after stabilization.

The gas contains about 20% by volume of sulfur in the form of hydrogen sulfide—necessitating extreme safety precautions. Pending installation of automatic custody transfer equipment, Canadian Oil, for in-

[1] Includes discoveries to Dec. 31, 1957, as estimated by Alberta's Oil & Gas Conservation Board.

Protective gas mask is worn by separator operator during gauging of storage tanks at Innisfail.

Christmas tree for regulation of oil and gas flow at White Rose-C.&E. Innisfail 1-16 discovery well.

stance, requires all gauging to be done by a two-man team equipped with respirators. High pressures and lost-circulation zones present completion problems, particularly when an attempt is made to set casing in the pay section. Most completions to date have been handled by setting 7-in. casing above the reef, then drilling out and running a liner. On edge wells, it is expected the reef can be penetrated before running casing—thus permitting use of 5½-in. casing and elimination of the liner.

No blowouts have occurred, although failure of a christmas tree on a completed well, resulting in a short-lived fire, caused several anxious hours last December.

Solution-gas reserves are tentatively estimated at 80 billion cubic feet, with recoveries of LPG of three million barrels and 500,000 long tons of sulfur. No estimate has been made of the gas-cap reserves, but they should equal 10% to 15% of the solution-gas reserves.

Currently the gas is being flared, but the recently formed operators' committee is developing plans for a processing plant to convert the present obnoxious odors into revenues.

Rangeland Pipe Line Co. has constructed an 18-mile pipeline extension itno the field, and the oil is moved to Edmonton where it is available to both the eastbound Interprovincial Pipe Line Co. and the westbound Trans Mountain Oil Pipe Line Co. Posted field price is currently $2.44 per barrel.

The history of the discovery is interesting, and is typical of the long and costly process leading up to most discoveries.

Canadian Oil Companies Ltd., originally a marketing and refining company, became fully integrated in 1955 through the purchase of Anglo-Canadian Oil Co., an oldline Canadian producing company since early Turner Valley days.

Among the undeveloped acreage acquired, through the Anglo purchase, was a strip consisting of alternate sections two miles wide and 28 miles long from east to west. It was the easternmost portion of this strip which, on the basis of subsurface geology and seismic work, done in 1953, was thought to be underlain by a reef structure. Subsequent drilling has proved this well may have been less than one location away from reef production.

Obviously, there was not a sufficient concentration of acreage to justify an 8,500-ft wildcat test costing about $150,000 to drill, and Anglo requested the Department of Mines and Minerals of Alberta to post a drilling reservation.

Drilling reservations consist of crown lands offered to the highest bidder, with the successful bidder being permitted to earn leases on a number of quarter-sections by drilling a test well to a required depth. The remaining acreage—not selected—reverts to the crown, and is offered for sale piecemeal at subsequent crown sales.

Such a reservation was posted, but Anglo was outbid at the sale. The successful bidder failed to drill the required test, and at the end of a year the reservation reverted to the crown.

Canadian Oil had, by this time, acquired Anglo and, with its partners in the strip—Calgary and Edmonton Corp. Ltd. and Security Freehold Petroleums Ltd.—obtained a farmout of additional acreage in the area whereby a 50% interest could be acquired by drilling a D-3 test. A crown drilling reservation was again requested, and this time a bid of $25,500 proved successful. A total of 4,997 acres was included in the reservation, of which 10 quarter-sections could be leased upon completion of a D-3 test on the reservation.

After further detailed seismic work, a location was staked on the farmout acreage less than 1½ miles east of the subsequent discovery well. This well encountered the

Table I

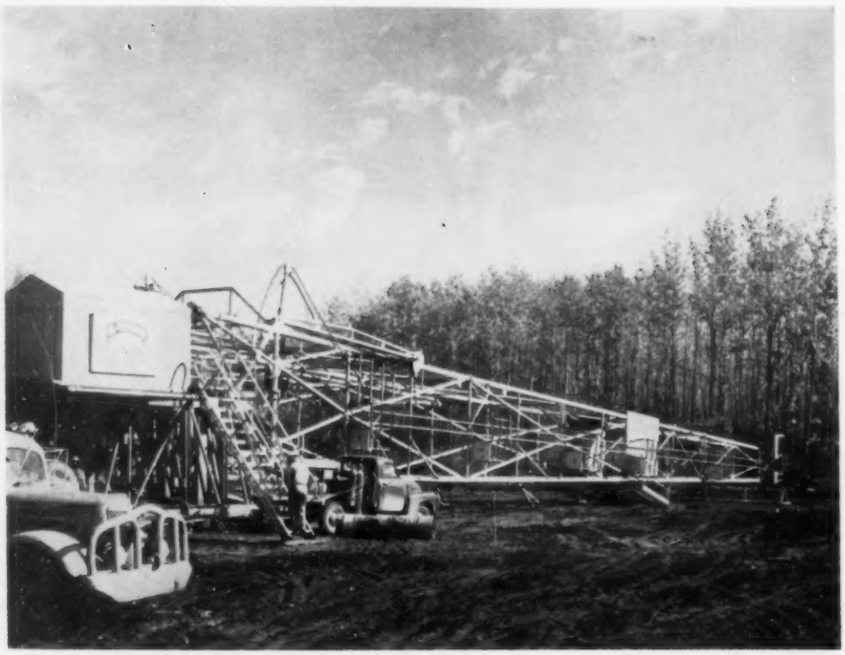
ALBERTA'S PRINCIPAL LEDUC (D-3) FIELDS

Field	Year Discovered	Virgin Reserves (Millions of Barrels)
Redwater	1948	850
Bonnie Glen	1952	400
Wizard Lake	1951	225
Leduc-Woodbend	1947	160
Golden Spike	1949	160
Sturgeon Lake S.	1952	125
Westrose	1952	90
Acheson	1950	50
Innisfail	1957	50

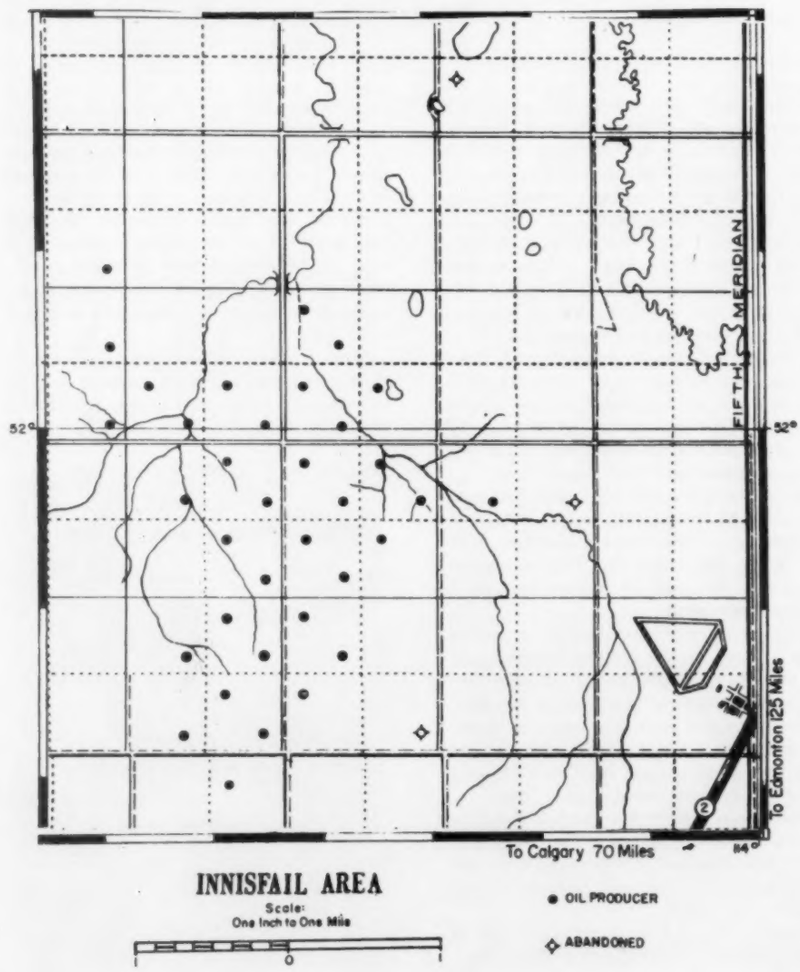
OTHER PRINCIPAL FIELDS

	Year	Millions of Barrels
Pembina (Cardium)	1953	1,000
Fenn-Big Valley (Nisku)	1950	180
Turney Valley (Rundle)	1936	160
Leduc-Woodbend (Nisku)	1947	85
Hormotton-Elkton (Rundle)	1955	80
Joarcam (Viking)	1949	60

Reserves, excluding Innisfail, from table prepared by Petroleum & Natural Gas Department, Canadian Bank of Commerce.



Drilling-rig mast is ready to be raised at White Rose-C.&E. Innisfail 13-3 well location.



reef, but found it water-bearing. Fortunately, a thin section of basal Cretaceous sand formation proved productive, and the well was plugged back to a depth of 6,745 ft and completed in this zone.

A second well, located ½ mile east and planned as a Cretaceous test only, was then drilled, but found the oil sand had pinched out. While the original Cretaceous producer earned the farmout lands, neither well had been drilled on the drilling reservation. To avoid loss of this acreage and to check the extent of the Cretaceous oil sand, a third well was located 1½ miles west. Here again the sand had pinched out. However, Cretaceous markers had logged 30 ft to 40 ft higher than anticipated—indicating the possible presence of reef buildup in the Devonian. A decision was made to carry the well on down in the hope that the higher reef structure would be oil-bearing. This proved to be the case when the reef was encountered at 8,436 ft, 240 ft higher than at the original well 1½ miles east.

The first drill-stem test of this top 10 ft of reef flowed gas to surface in 5 min and oil in 22 min. The entire pay section was cored and tested at intervals with similar results. 5½-in. casing was run to 8,648 ft and a 20-ft interval from 8,498 ft to 8,518 ft perforated with four shots per foot. After a light acid wash and squeeze, the well was opened up on July 28, 1958; it flowed at the rate of 200 bbl of oil per hour through open tubing. Placed on a 14/64-in. choke, the well then produced at the rate of 20 to 25 bbl per hour.

The well was granted a discovery allowable of 600 b/d by the Alberta Oil & Gas Conservation Board. This was later reduced to 450 b/d; and, on November 1, Innisfail was officially designated as an oil field by the board, and all wells went on regular allowables. Currently, the wells are allowed to produce at the rate of 109 b/d. This rate includes the well's economic allowable of 68 b/d plus its share of Alberta market demand, calculated on the well's MPR, or ability to produce.

After selecting 10 quarter-sections under the terms of the drilling reservation, Canadian Oil, together with its partners, held a 100% interest in 4½ sections within the probable field limits, together with a 50% interest in 4½ sections of farmout acreage, one or more of which lie within the field limits. At a crown sale in October 1957, the partners acquired 100% in an additional quarter and 50% interest in an additional ½ section—both lying on the edge of the probable field. As a result, the team —whose holdings are shared 50% to Canadian Oil and 25% each to Calgary & Edmonton and Security Freehold—holds the most acreage in the field and probably has 2/3rds of the total reserves.

Producers holding acreage in the balance of the field include Canadian Superior Oil of California, Hudson's Bay Oil and Gas Co. Ltd., Imperial Oil Ltd., Royalite Oil Co. Ltd., Cree Oil of Canada Ltd., California Standard Co., and Dernick and Guyer.

END

In a wheat field in central Manitoba, construction proceeds on the western section of Trans-Canada's natural-gas line from Alberta to eastern Canada. The bending machine bends an 80-ft double joint of 34-in.-diameter pipe to fit the contours of the ditch. Because work is done on a 60-ft right-of-way obtained from the farmers, crops cannot be damaged.

Natural gas in western Canada

by Floyd K. Beach

Experts estimate ultimate reserves at 300 trillion cubic feet in plea for export market development. Westcoast market expansion indicates probable doubling of new line. Last leg of Trans-Canada line to be completed this year.

WESTCOAST TRANSMISSION completed its line from the gas-processing plant at Taylor, B.C., to the United States border near Vancouver early in August 1957, and held a formal opening of the line early in October. This line delivers gas at the border for use in the United States; and it also supplies Vancouver and (through a subsidiary) gas to points in the interior of British Columbia. It had no sooner been completed than an announcement was made by B. C. Electric of plans to construct a steam-electric plant to use 144 million cubic feet daily to develop 900,000 kva, scheduled for completion in 1961. With an initial throughput capacity for the line of 400 mmcf per day, Westcoast immediately talked of duplicating the line, which is of 30-in. diameter and some 650 miles long—plus gathering lines of various sizes 156 miles long. Additional compressor stations would be able to increase the capacity of the present line to 660 mmcf per day.

Alberta Gas Trunk Line delivered its first gas to Trans-Canada Pipe Line, for transmission eastward, on July 23. Trans-Canada has completed its line from the Alberta-Saskatchewan border as far as Fort William and Port Arthur, and some work has been going on during the winter across the Precambrian Shield in the portion of the line being constructed by the Crown Corp. During 1957, line was also laid from Toronto to Montreal, and gas brought in from the USA on a temporary basis has been used. Completion of the main transmission line from Alberta to the east is expected during 1958.

Gas pipeline construction has kept pace with the industry. During 1957, a total of 4,300 miles of natural-gas pipeline was constructed—including the major transmission systems such as Trans-Canada, Westcoast Gas Transmission, field gathering, and provincial gathering systems such as Alberta Trunk.

Meanwhile, markets for gas from western Canada appear to be much greater than were originally expected; and, even without any export of gas at Emerson to USA lines, the Trans-Canada project is expected to be economic.

Initially, Trans-Canada feared it might be squeezed between the price paid to producers and realized price from distributors after meeting fixed charges. The initial price offered to producers was 10¢ per mcf at a field gate after gathering and processing had been done by the producer. This price did not achieve sufficient contracts, and Trans-Canada has now raised its price to 13¼¢ to the end of 1960—escalating ¼¢ yearly to a maximum of 18¾¢ in 1982. Trans-Canada has now made contracts with producers for gas totaling 4.3 trillion cubic feet of proved reserves; and, if we add probable reserves in the fields under contract, the amount somewhat exceeds the 4.35 trillion cubic feet now allocated to the company by the Alberta Oil and Gas Conservation Board.

Since it is expected to take at least a year from the time of application for an increase in export allocation until granting of the request, Trans-Canada has already asked for an additional 1.2 trillion for use in Canada, plus 2.0 trillion if export to the USA at Emerson is authorized.

Both Trans-Canada and the Conservation Board look to a rolling reserve of 30 years to protect Alberta consumers.

Other Export Proposals: Westcoast has made tentative contracts to purchase sour gas from Savanna Creek and the Calgary field, to be taken as far as Coleman for fixing sulfur and the processed gas to be piped via Crowsnest Pass to Kingsgate, B.C., where it will be picked up by the same organization which takes gas near Vancouver. Hearings in respect of this application have taken place before the Alberta Conservation Board.

Alberta and Southern—a new company allied to Alberta gas distributors, Canadian Western Natural Gas and Northwestern Utilities—has a scheme to export gas from

Construction of a section of pipeline near Consort, Alberta, linking Provost natural-gas fields to main Trans-Canada Pipe Line (Royalite Oil photo).

fields in western Alberta, and has signed tentative contracts with producers as well as for sale—the gas being destined for San Francisco.

Incidentally, Dr. C. R. Hetherington, vice president of Westcoast, has stated the two projects are not in conflict.

Prospects of Export to United States: Hon. C. D. Howe, when trade minister in the liberal government, had made some commitment to permit export by Trans-Canada to the United States at Emerson. The commitment appears to have been tentative and contingent on permission by the Federal Power Commission. It also needed further Canadian approval when the appropriate time arrived. The election, June 10, 1957, defeated the liberal government, and Mr. Howe went down to personal defeat along with a number of other cabinet ministers.

The new progressive conservative government headed by John Diefenbaker, when questioned about export of gas to the USA, was at first noncommittal, but shortly announced a Royal Commission on Energy, with a directive to examine the whole situation respecting natural gas and other sources of energy. The commission is headed by Henry Borden, a Toronto industrialist, with eight other members representing widely distributed talent from various parts of Canada. The Canadian Petroleum Assn. put forward urgent appeal for early decision respecting gas export on the grounds that, once pipeline connections are made, markets are set up which are likely to continue over long periods, and Canadian producers are likely to be left without market for gas. They felt a delay of a month or so would not be critical, but a delay running into years might be most adverse. It was then announced that the commission was to submit an interim report on natural gas in advance of the final report involving other energy sources.

Royal Commission on Energy: Commission opened its proceedings by a hearing in Calgary starting February 3 and continuing most of the month, adjourning to Toronto. The Calgary hearing gave evidence that the commission was composed of members who wanted to know the facts and not merely listen to what interested parties had to offer.

The hearing opened with addresses by Premier Manning of Alberta and the Deputy Minister of Mines and Minerals, H. H. Somerville and, in the course of their submissions, they showed that the health of the industry hinged on some revenue from the many potential gas wells which have been waiting for a long time for market outlet.

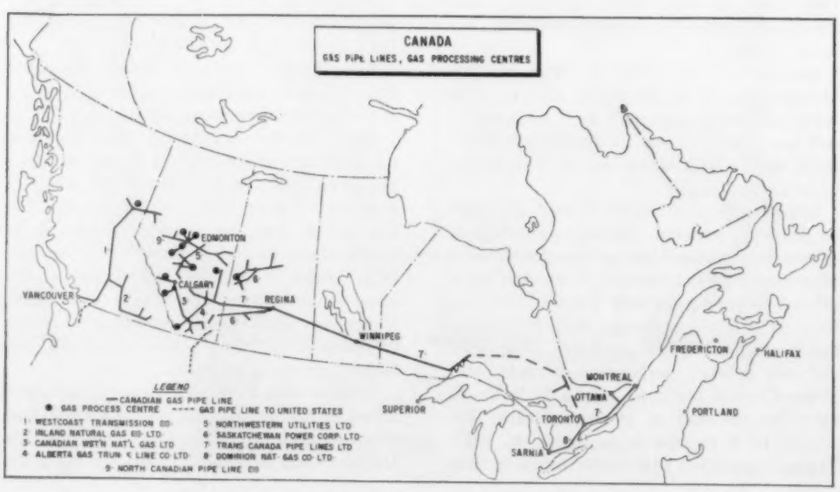
This writer entered a submission, giving historical background on the industry—including the reasons for need of controls exercised by government agencies.

The Alberta Oil and Gas Conservation Board made a voluminous submission showing, among other items, the details of presently known gas reserves amounting to more than 21 trillion cubic feet. They went further into the future, projecting from the amount of gas discovered per wildcat well drilled, regardless of success or failure of each well, and considered that, by the time 20,000 wildcat wells have been drilled in Alberta, some 83 trillion cubic feet will have been discovered.

The Canadian Petroleum Assn. presented, through a number of technical witnesses, estimates of proved and probable reserves now known in western Canada—totaling some 30 trillion cubic feet. They also projected probable gas reserves on the basis of cubic miles of sediments and average discoveries in other parts of the world. Given proper incentives for the search, they expect the industry can eventually find gas of the order of 300 trillion cubic feet.

Westcoast presented a submission respecting their present developments and their wishes respecting export from southwestern Alberta. They then were faced with questions from the commission and its counsel as to their financial setup, including the number of shares allotted to directors at 5¢ a share and the fact that the stock has been traded by the public at around $19 a share. They were also questioned as to the price of gas at the USA border of 22¢ per mcf as against delivery to Vancouver gate of 32¢ per mcf. Counsel for Westcoast argued that, when shares were allocated to the promoters at 5¢, the shares had no real value, and it was only by the faith of the promoters and the money they poured into the drilling of wells and negotiations for market that the shares acquired any value. Counsel also felt that bonus to promoters is a recognized procedure. The price of gas in large volume and at a high load factor is bound to be lower than the price in smaller volume and poorer load factor, and the contract to supply large volume to USA purchasers was necessary in order to warrant building the transmission line, gathering lines, and processing plant. Subsequent news items have shown that the price of gas at the Seattle gate is comparable with the price at the Vancouver gate, plus cost of transmitting the extra distance.

Trans-Canada Pipe Lines presented evidence under oath (at its own suggestion), and showed that projection of future demand within Canada over a 30-year period is likely to run to figures comparable with present Alberta gas reserves. They made allowance in their figures for export at Emerson of around 200 mmcf daily—not increasing with time—but the aggregate amount of export was insignificant in the whole picture. Alberta expects in the same 30-year period to use some seven trillion cubic feet, and the Trans-Canada demand for eastern Canada with a much greater population and more highly industrial development is only about three times as great. Again, the commission inquired into the financial setup of Trans-Canada. It was shown that the stock went to the public at $10 a share. N. E. Tanner—who was the first president, and who saw the project through to the time it became a going concern—received 1,000 shares at $1.00, and both he and Charles S. Coates received blocks of stock at $8.00.



Medicine Hat Gas Field: The Saskatchewan Power Commission contracted to take gas from the eastern part of the Medicine Hat field, and now has clearance from the Department of Transport (Canada) to lay gathering lines into Alberta to pick up the gas. Britalta Petroleums and Crescent Corp. hold a large block of acreage in which gas has been proved in Townships 13 and 14, and the south tier of sections in Township 15, while Canadian Export Gas holds a smaller block in Townships 11 and 12. The operators will need to drill development wells this year, and SPC is to lay gathering and transmission lines. The contract is to pay 10¢ per mcf at the well head up to October 1, 1958, after which the price is to be renegotiated. An estimated 5.5 billion cubic feet is to be supplied during the year starting October 1, 1958.

Export to Montana: Montana Gas Co. has been taking gas from Pendant d'Oreille field, other fields in the vicinity owned by them, and has been buying some gas in a field owned by another company. The gas goes to the company's distribution system in Montana—which includes the copper smelter at Great Falls. Montana Gas supported the application of Alberta and Southern for permission to export more gas—saying they could use additional supplies. Comment was heard at the Royal Commission on Energy that cheap Canadian gas is being used to smelt USA ore at a time when Canadian mines are being shut down due to restrictions on sale of Canadian copper and base metals in the United States.

Alberta Gas Trunk Line: An extension of 145 miles of 24-in. pipe to be built in 1958 will connect the Pincher Creek field with the main transmission line at Princess. The contract has been let, and crossings of rivers and canals are to be laid at once in order to take advantage of low water in rivers and empty irrigation canals.

Sulfur: Pincher Creek field contains high content of hydrogen sulfide which must be removed before the gas is acceptable to the pipeline, and a number of other fields which will deliver gas to Trans-Canada will also need sulfur removal. The sulfur will be fixed in large quantity once Trans-Canada gets up to capacity. Marketing of sulfur will be somewhat of a problem, but not entirely incapable of solution. Present plants for fixing sulfur from hydrogen sulfide in Alberta are Shell's plant at Jumping Pound, Royalite's plant in Turner Valley, and one at Pincher Creek where some gas from the field has been stripped and returned to the reservoir pending gas outlet via Alberta Gas Trunk Line. A plant at Taylor, B.C., was recently completed as an adjunct to Westcoast processing plant. Jefferson Lake Sulphur built this plant, and operates it using hydrogen sulfide removed by Westcoast from gas going to pipeline.

At present freight rates from Alberta to eastern Canada, sulfur would have to be given away in order to be competitive in the East with sulfur from the Gulf Coast. However, it can be shipped to the West Coast for paper mills at a living price. Some of it goes into fertilizer as ammonium sulfate at the plant of Northwest Nitrochemicals at Medicine Hat; and some goes to uranium mines, where it is converted to sulfuric acid and used for leaching uranyl from ore. There is also a sulfuric-acid plant at Fort Saskatchewan (near Edmonton).

A low-value product which can be shipped in bulk is likely to be able to negotiate advantageous rail rates, and also favorable ocean shipping rates. Already we hear of bulk loading facilities in preparation at Vancouver, and markets for sulfur should develop in the Orient. Some stockpiling of sulfur may be necessary for a time; but authorities on sulfur marketing suggest that stockpiles of the material near the place of consumption would assure users of continuity of supply, and stockpiles adjacent to ship-loading facilities would assure ships of quick loading. The various producers have been advised to utilize a common marketing agency as a means of cutting sales costs.

In preparation for the large-scale movement of gas to eastern Canada, work is in progress to build up treating facilities for removal of sulfur and LPGas. British American Oil began its development in this direction nearly two years ago in the huge Pincher Creek sour-gas field. First step was erection of a 225-ton-per-day sulfur-removal and 1,500 b/d condensate plant. This unit went onstream early last year, processing 55 million cubic feet per day and returning the gas to the formation.

The plant now is being expanded to produce 450 tons per day of sulfur, 25,000 gal per day of propane, and 40,000 gal per day of butane. The current expansion will be completed in August—well ahead of first deliveries of gas to Toronto through Trans-Canada. A third stage also is planned for later construction, which will raise sulfur output to 800 tons per day and condensate to about 6,000 b/d. B-A will be the largest single supplier of gas to the Trans-Canada line.

B-A also has been building a gas-conservation system at Nevis for the Stettler and Fenn-Big Valley fields. Although not yet at full capacity, the Nevis plant currently is producing 25,000 to 30,000 gal per day of product. Field separating plants have a combined capacity of 13 million cubic feet daily.

LPGas: Not only sulfur, but liquefied petroleum gas, will need to look to markets as Trans-Canada gets in full swing. Surface storage of propane is very expensive, and butane storage only a little less costly. Some studies are being made to find salt beds strategically located in which underground storage will be possible.

After dissolving a cavern in rock salt, it becomes possible to store LPGas at much smaller cost than in pressure vessels at the surface. Once a cavern has been made by solution, it is advisable to use brine to replace LPGas on withdrawal, for use of fresh water would enlarge the cavern. In most agricultural localities, storage of brine in surface pits is a detriment to adjacent farm land; but there are places in eastern Alberta and western Saskatchewan where lakes and sloughs are very saline—in many cases with sodium sulfate highly concentrated. Also there is a thick series of halite at depth. With a suitable location for LPGas storage underground and a pipeline to serve it, the propane industry could be taken from a hand-to-mouth existence and brought to a point where it could operate the year-round in confidence of being able to supply the market on demand and enlarge its clientele. Some export of LPGas would probably accompany the increased supply. END

British American Oil Co.'s sulfur plant near Pincher Creek, Alberta, nestles in the foothills 35 miles from the Canadian Rockies.

B-A's Nevis plant, not yet operating at full capacity, currently is producing 20,000 to 30,000 gal per day of product out of solution gas from Alberta's Fenn-Big Valley and Stettler fields.

View of top of catalytic cracking unit at Royalite's 6,500 b/d refinery at Saskatoon, Sask. (Royalite Oil Co. photo).

Refinery capacity up 60,150 barrels

Two major projects are to be completed this year, and four more in 1959

CAPACITY of Canadian oil refineries increased 60,150 bbl per calendar day in 1957, to 762,200 b/d. This compares with an increase of 71,600 b/d in 1956 and 73,700 b/d in 1955. The increase of 8.5% in capacity was at a somewhat greater rate than the expansion of domestic demand, but capacity at the end of the year still was not adequate to meet the nation's requirements. Product imports into Canada in 1957 averaged about 100,000 b/d.

Two-thirds of the 1957 capacity increase was in Ontario, where British American Oil Co. Ltd. added 36,000 bbl to its Clarkson plant and McColl Frontenac Oil Co. Ltd. activated a 6,000-bbl crude unit at the recently purchased Port Credit refinery formerly operated by Regent.

In addition to the capacity increases activated last year, there are six major projects now in progress or about to get under way, and two others announced for later construction. Combined crude capacity of these eight jobs will be about 147,000 bbl. Only two of the big jobs will be complete this year—adding 30,000 b/d to capacity. The big bulge will come in 1959, when 77,000 bbl of new capacity in four plants will be ready for operation. The remaining two plants, expected to have a combined capacity of 40,000 b/d, are not scheduled for completion until 1960 or later.

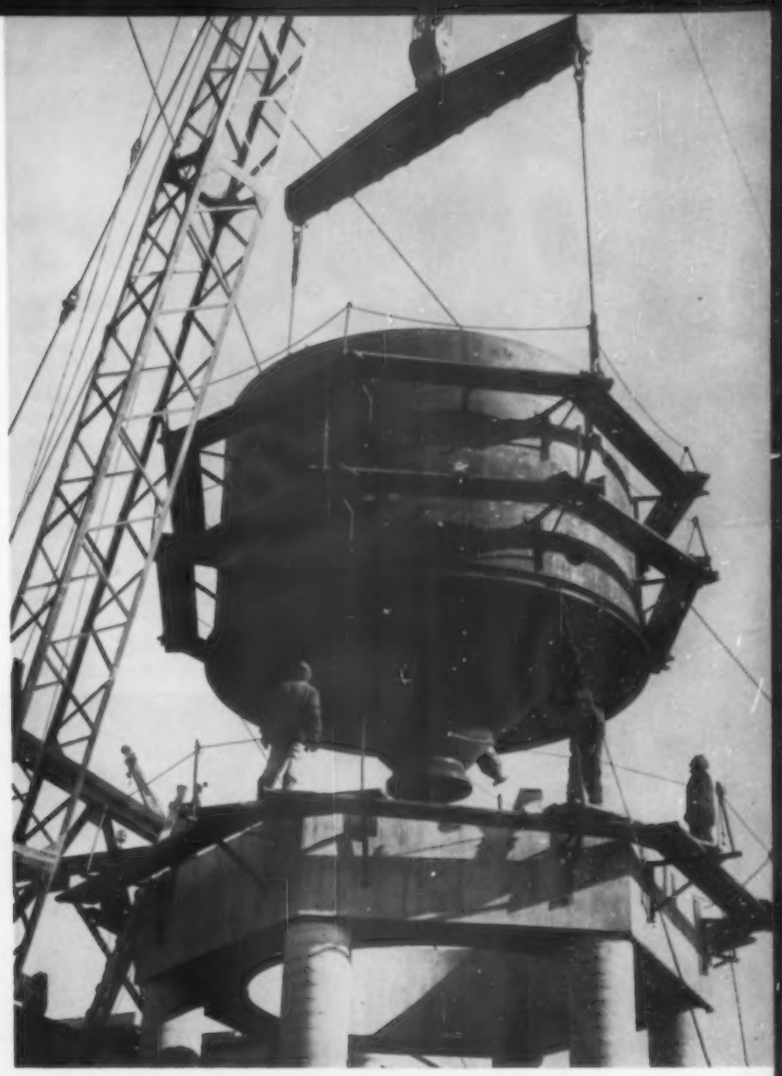
Indicated Canadian capacity at the end of the year in the next few years thus will be at least as much as shown below:

Year	*Barrels Per Calendar Day*
1957	762,000
1958	792,000
1959	869,000
1969	889,000

Some concern has been expressed that Canada may be overbuilding. This, of course, will depend largely on the rate of growth in domestic demand. Even if the growth rate does not fall materially below 1957, the building program still will not keep pace with requirements. Instead, imports of finished products still will be required each year.

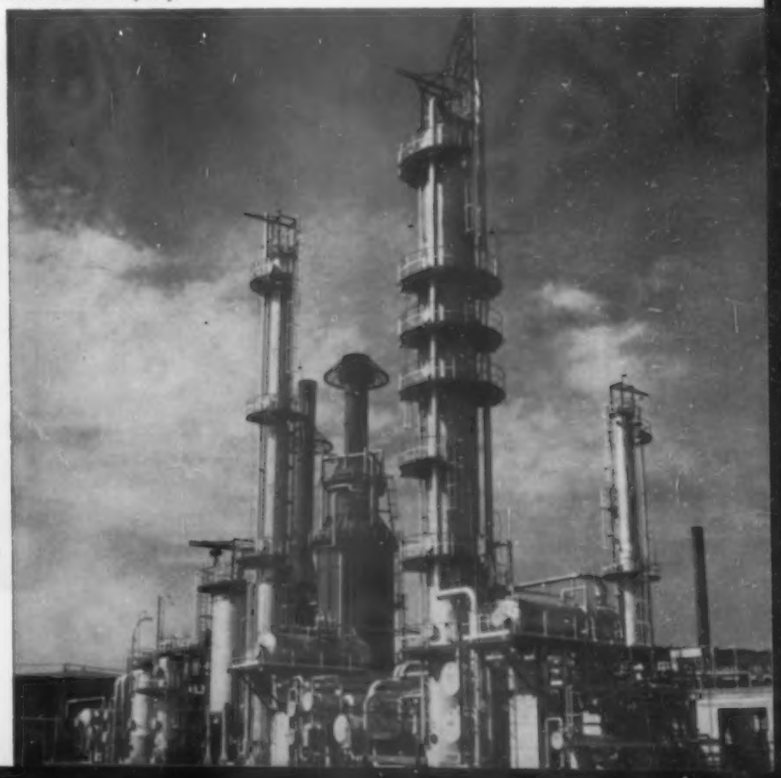
In 1957, domestic demand in Canada rose about 5.25%, or 38,000 b/d, as shown in the leading article by Messrs. Graham and Sievwright in this issue. Average for the year was about 759,000 b/d, and average available crude capacity in the dominion was less than 726,000 b/d. Plants did not operate at 100% of calendar-day capacity, of course; and yield from a barrel of crude is not 100%. Therefore, there was a net shortage of about 90,000 b/d made up by imports.

Most economists in Canada are anticipating another increase of 7% in demand this

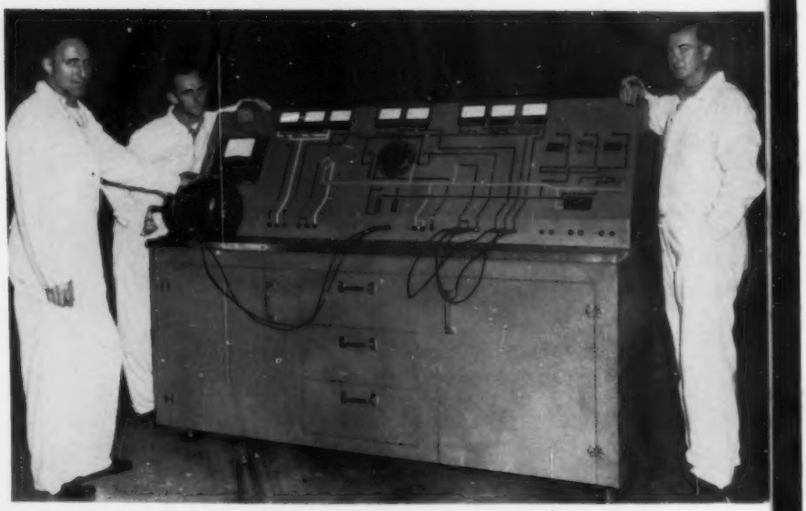


In 5-below-zero weather, first section of cat-cracker tower was lifted into place, at Cities Service Trafalgar refinery at Bronte, near Toronto. The $27 million refinery is scheduled for completion early next year.

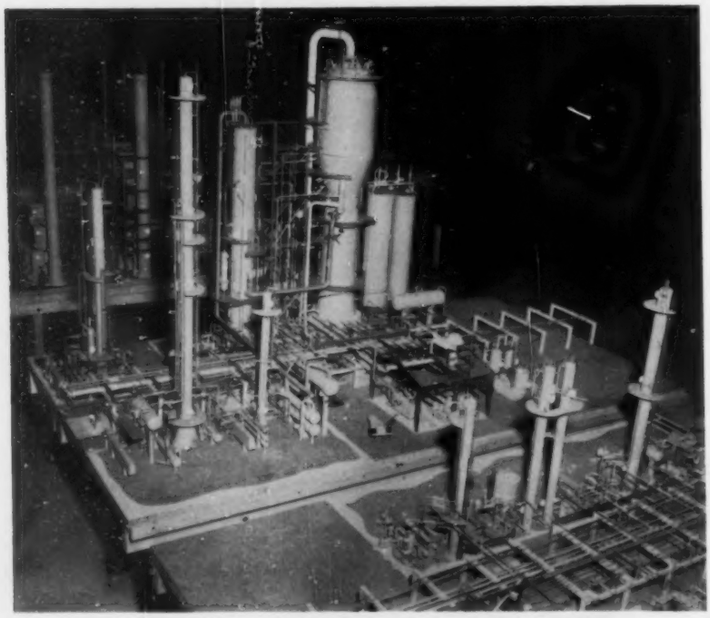
This 8,000 b/d Powerformer is now in operation at Imperial Oil's Montreal East refinery.



British American Oil Co.'s new West Coast refinery is situated on a hilltop 500 ft above Barrard Inlet, adjacent to the company's marketing depot. Photo shows site on February 17, 1958.



This portable test panel was designed and built at Shell Oil Co. of Canada's Shellburn refinery by engineers and repairmen of the maintenance department to meet the needs of the electrical group. The panel will supply variable AC or DC voltage; and includes ammeters, volt meters, a vacuum-tube volt meter, timers, and a controlled temperature box—all mounted on a portable cabinet. Facilities are provided for maintenance and operational tests of switchgear control components, motor controls, laboratory equipment, and small motors. All can be done with a minimum of setup time by the use of plug-in connections on the graphic-type panel.



A scale model of the 9,000 b/sd Kellogg Orthoflow fluid catalytic cracker being installed at British American Oil Co.'s Port Moody refinery.

This completely integrated refinery at Port Moody, B.C., being built for The British American Oil Co. Ltd., is due to go onstream in the fall of 1958. The engineering, procurement, and construction are being handled by The Canadian Kellogg Co. In addition to topping and vacuum facilities, the main installations include an Orthoflow fluid catalytic cracker, and catalytic reforming, hydrodesulfurization, and alkylation units (Canadian Kellogg photo).

year, which would bring product requirements to 802,000 b/d. This compares with an expected average effective refinery capacity of 777,000 b/d. Assuming operations at 10% of rated capacity, it may be necessary again to import 100,000 b/d of products this year. Similarly, it may be calculated that Canadian distributors will be importing refined products in 1959 and 1960.

Biggest project this year is the new 20,000 b/d refinery being built by British American Oil Co. Ltd. at Port Moody, B.C. B-A. is Canada's second largest integrated oil company—with refineries operating in Montreal, Que.; Clarkson, Ont.; Moose Jaw, Sask.; and Calgary and Edmonton, Alta. The Port Moody plant, scheduled for completion in November, will be the company's sixth. The Clarkson and Edmonton refineries were expanded during 1957, and further expansions are planned for 1958 at the Clarkson and Moose Jaw refineries.

B-A's total refining capacity—which rose 38% during 1957 to a record 145,600 b/sd—will be increased by an additional 20,000 b/d when the $20 million Port Moody refinery is completed.

Ground was broken, in June 1957, on the 400-acre site adjacent to B-A's Burnaby marketing depot on Burrard Inlet, and construction is now well under way.

Several of the approximately 50 crude-oil and product storage tanks have been completed, and work has commenced on most of the main units which will include: crude topping and vacuum; catalytic cracking; middle-distillate desulfurization and alkylation; naphtha desulfurization and catalytic-reforming units.

The catalytic reformer at Port Moody, and a 5,400 b/d unit scheduled for completion later this year at the Moose Jaw refinery, will be the fifth and sixth cat-reformers built by B-A in the past three years. Reformers went onstream at Edmonton and Clarkson during 1957, and at Calgary and Montreal previously. The units use platinum as catalyst in production of high-octane reformate for use in B-A gasolines.

The $3 million cat-reformer at Edmonton was added as a further step in B-A's quality-improvement program, in Alberta. The $4 million unit at Clarkson is providing a greater supply of high-quality gasolines for the central Ontario market.

To handle the increased demand for lubricating oils, greases, and other packaged products across Canada, additional warehouse and storage facilities are being considered for construction at Clarkson later this year. A catalytic desulfurization unit will also be included in the Clarkson refinery's 1958 expansion program.

A major phase of B-A's 1957 expansion program was completed at Clarkson in September, where additional crude processing facilities costing approximately $5½ million virtually tripled the refinery's capacity—to over 60,000 b/d from 21,500 b/d. Completion of this expansion coincided with the extension of the Interprovincial Pipe Line from Sarnia to Clarkson.

During 1957, crude processed by the company's five refineries and for the company's account reached a new record of 40,385,300 bbl, a 6.7% increase over 1956.

Domestic crude was used exclusively at all western refineries; and, with the completion of the Interprovincial Pipe Line into the Toronto area in October 1957 close to 80% of all crude processed at the Clarkson refinery was from Canadian fields. The remaining 20% consisted of special Venezuelan crude processed to meet the demand for high-quality asphalt products in Ontario.

The Montreal East refinery continued to use Venezuelan crude, with a small percentage of Middle East crude, because of the economic advantages of tanker oil on the eastern seaboard.

In the field of product control and analysis, B-A was the first Canadian oil company to make use of a mass spectrometer. Located at the Montreal East refinery, the $60,000 high-vacuum electronic instrument is capable of providing qualitative and quantitative analyses of gas and liquids. Used in conjunction with other related tools, the mass spectrometer has proved to be an invaluable aid in the solution of many analytical problems which arise in the petroleum industry.

Increased use is being made of data-processing equipment in many phases of refinery operations and cost control. At the company's head office building in Toronto is a section of the operations control department, called "Operations Research," the duties of which are to apply scientific methods and analyses to problems within the manufacturing department and to solve each in the manner most effective to the company's overall operations.

The chief tool is the mathematical model. This is a group of equations describing actual operations mathematically which can be manipulated to show the effects of any desired change.

Biggest project to be completed in eastern Canada this year is the Petrofina expansion at Montreal. Elsewhere in this issue is an article describing how 50% is being added to the throughput of this refinery, which was completed as an entirely new project only three years ago.

Major construction jobs to be completed in 1959 include the 20,000 b/d Cities Service plant in Ontario, the 30,000 b/d British Petroleum Co. refinery at Montreal, the 20,000 b/d addition being made to the Canadian Oil Companies Ltd. refinery at Sarnia, and the Imperial Oil Ltd. reconstruction of its Calgary plant.

Cities Service has been a marketer in Canada for 35 years, but has imported or purchased products locally. The company's system of 750 resale outlets is being expanded at a cost of some $8 million. A two-year program adopted in 1957 envisages 1,000 outlets for the refinery in 1959.

The man who originally recommended the Canadian expansion program now directs it from handsome headquarters offices on Toronto's stately University Avenue. Formerly marketing coordinator for the entire group of Cities Service companies, Robert J. Hull was sent to Canada in 1956 to report on the Canadian market. On January 1, 1957, W. Alton Jones, chairman of Cities Service Co., announced that Mr. Hull had been appointed president of Cities Service Oil Co. Ltd.

The high regard for relations with the public which characterizes all Cities Service affiliates is particularly emphasized in the Canadian company. Before construction began on the Trafalgar refinery last year, vice president for manufacturing Vivian E. Sicks had taken a hard second look at original plans for locating the $27 million refinery on the company's 440-acre property a short distance north of Lake Ontario, near the village of Bronte. Mr. Sicks figured the plans could be revised to "relocate" the planned refinery further north on the property, away from Bronte—although no community officials had suggested this, and it would substantially increase cost of water-intake and effluent systems into the lake. The plans were revised.

Altogether, Mr. Hull estimates some $3 million is being spent for public- and community-relations refinements. A silencer on the cat-cracker stack—and on the furnace—are among measures taken to reduce noise. A special tip on the flare will assure smokeless burning; and furnace stacks are being lengthened well above API recommended safe heights.

Water-effluent handling facilities—designed by Hydrotechnic Ltd.—are the subject of special attention. Water will be withdrawn from 1,500 ft out in Lake Ontario and returned 500 ft out. Besides a storm-water drainage system, five separate sewer systems will handle phenolic water, oil water, tank drawoff, caustic and sanitary wastes—with biological and chemical oxidation, as well as chemical flocculation, purifying the effluents.

"The water we use will be returned to Lake Ontario purer than when we took it out," says Mr. Sicks.

Care was taken to balance location requirements with preservation of green belts at the refinery site. A dense screen of woods has been left untouched between operating units and the nearest residential areas. Handsome landscaping around an architecturally pleasing administration building will create a parklike entrance.

"In operating efficiency, quietness and safety, and general appearance, the Trafalgar refinery will exceed any similar in-

Part of the Cities Service "spectacular" station on the Queen Elizabeth Way, near Toronto: Station, with dining and coffee-shop facilities for 162 persons, cost one-third of a million dollars.

stallation anywhere," Mr. Hull told reporters when first sod was turned for the project last August.

First component of Trafalgar's cat-cracker was hoisted into place in mid-February. The winter work force of some 400 men will increase to more than 1,000 through peak summer months—with local labor given first priority by the general contractors, C. F. Braun & Co. of Canada.

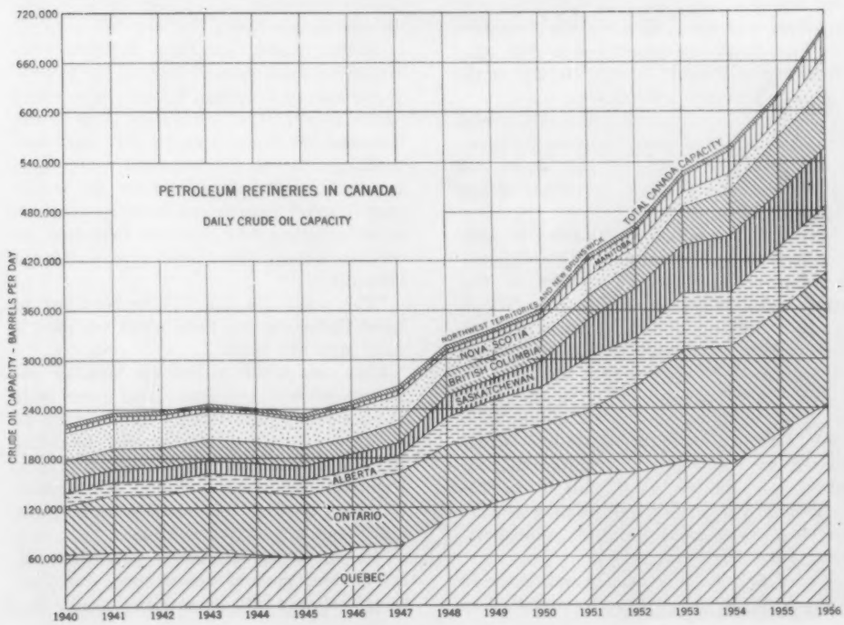
The new 20,000 b/sd Cities Service plant is designed for maximum production of high-quality motor fuel and middle distillates. Major components consist of a 20,000 b/d low-pressure two-stage topping unit, an 8,200 b/d vacuum unit, 7,000 b/d UOP stacked fluid cat-cracker, a 3,500 b/d catalytic desulfurizer—using cobalt-molybdate catalyst—and a 3,500 b/d Sinclair-Baker cat-reformer. Treating processes will include regenerative caustic, the Bender process, and Electrofining.

Power is to be purchased. A 100,000-lb-per-hour steam plant will be built, and 1,800 gpm of water pumped to the site from nearby Lake Ontario. The water-effluent system will employ biological and chemical oxidation and chemical flocculation.

The company which is now expanding so rapidly was formed in Canada in 1922, and for two years operated primarily as a wholesale petroleum-products supplier. In 1924, Cities Service commenced its Canadian resale operations—with the acquisition of three service stations in Toronto.

Cities Service's marketing area extends roughly in a belt perhaps 100 miles wide from Windsor along the north shore of Lake Ontario and the St. Lawrence River, through Toronto, Montreal, and Quebec city. In this industrial and marketing heartland of Canada is located an estimated 60% of the country's purchasing power. The company's plans for the immediate future focus on strengthening marketing facilities in this area—to sell the gasoline, fuel oils, butane, propane, and other products which will start flowing from the Trafalgar refinery early next year.

Like its affiliates, Cities Service Oil Co. Ltd. markets through green-and-white service stations. All the new stations are based on designs by Henry Dreyfuss as "showplace" outlets. Best known of these in Canada is a handsome structure which presents a sweeping 270-ft facade—of green-and-white porcelain panels, redwood siding and cut-stone, red Roman and conventional brick, and plate glass set in steel channels—to motorists traveling the four-lane Queen Elizabeth Way between Toronto and Hamilton.



Completed in 1956 at a cost of just over one-third of a million dollars, the "QE" station houses a luxurious restaurant of 100-person capacity and a 62-seat coffee shop. Elegant decor, fine cuisine, and an attractively canopied six-pump servicing area draw hungry motorists with depleted gas tanks into this streamlined 20th century equivalent of Ye Olde English Inn.

Other Cities Service "spectaculars" currently opening in metropolitan Toronto are marked by the same handsome architecture and spacious approaches. At one site, full-grown silver-birch trees have been preserved and surrounded by raised-grass islands which indirectly guide traffic.

In addition to their basic function of selling gasoline, motor oil, and TBA, these new stations build prestige and recognition value for Cities Service, and establish the architectural "tone" for the more typical neighborhood stations and highway stations which account for most of any oil company's business. Cities Service has developed a group of modular stations on a basic Dreyfuss design which translates the architectural appeal of the "spectaculars" into the neighborhood setting.

A newcomer in Canada is British Petroleum Co., which has organized B.P. Canada Ltd. and begun development of a distributing system centering in Quebec as an outlet for its proposed new refinery. An investment program of $50 million to $60 million has been adopted. Previously, the parent British company had purchased a half-interest in Triad Oil Co., of Calgary, and begun an active campaign to develop crude-oil reserves in western Canada. The company has an interest in six million acres in the Prairie Provinces.

Marketing headquarters have been set up in Montreal, and the company is building a group of modern stations of distinctive design which make extensive use of glass. A feature is the return to the canopy which has been absent from most new service stations in Canada and the United States in recent years.

Currently, the company is buying products from other refiners in Quebec. This will be necessary for another year or more until the new 30,000 b/d refinery at Ville d'Anjou is complete. At this Montreal suburb, BP has purchased a 600-acre site three miles north of the St. Lawrence, and has arranged for a jetty right on the river for unloading crude tankers and dispatching products.

The Lummus Co. has been named as general contractor for the new refinery, and will employ Canadian subcontractors on various parts of the construction. The new BP refinery will include a catalytic reformer, catalytic cracker, polymerization unit, hydrodesulfurizer, and other conventional units. Work is to begin in about six months, and target for completion is the middle of 1960.

Third major new plant in eastern Canada is the proposed Irving Oil Co. refinery, at St. Johns, N.B. It is reported that Canadian Bechtel has a contract to design this in-

stallation which would have a capacity of 20,000 b/d or more. No official announcement has been made by the company itself, which is an important marketer in the Maritime Province. Only other large plant in this area is Imperial's 44,500 b/d refinery at Halifax, which was completely rebuilt two years ago.

In Ontario, Canadian Oil Companies Ltd. is making another effort to get a little ahead of demand. The company built a new 20,000 b/d refinery at Sarnia in 1952, but had scarcely finished it before expansion to 30,000 b/sd was necessary. This capacity now has been taken up by the company's growing distributing system; so a third expansion is being undertaken. A new crude still will bring capacity to 50,000 b/d. Completion is planned for 1959.

Canadian Oil Companies entered the petrochemical field last year by building a Udex unit as an auxiliary to its Platformer. Aromatics not required for motor-fuel improvement are sold as such. The present 8,000 b/d Platformer is being enlarged.

McColl-Frontenac Oil Co. Ltd. has just completed a 10,000 b/d hydrotreater at Montreal East. At this 59,000-bbl refinery, the company recently built an 11,000 b/d Platformer which supplies hydrogen for the new hydrotreater.

On the prairies, Imperial Oil Ltd. has begun the modernization and expansion of its Calgary refinery—one of the company's older plants, which first began operations 35 years ago. Present crude capacity of the plant is 8,000 b/d, and this will be expanded to 14,800 b/d. New units will include an atmospheric and vacuum distillation unit, a 6,600 b/d cat-cracker, and a 2,700 b/d Powerformer.

At St. Boniface, Man., North Star Oil Ltd. is building a 2,700 b/d Unifiner-Platformer. Procon Inc., the contractor, has scheduled completion for November 1.

Husky Oil & Refining Ltd. completed a 1,000 b/d dieselformer last month at its Fort William, Ont., plant. Storage capacity recently was enlarged by 120,000 bbl.

Royalite Hi-way Ltd. is erecting a new office building, laboratory, and employees' building at Saskatoon. New loading racks and warehouse were built last year.

Consumers' Cooperative Refineries Ltd., also at Saskatoon, is building a 3,000-bbl low-pressure coking unit. Completion is planned for November 30.

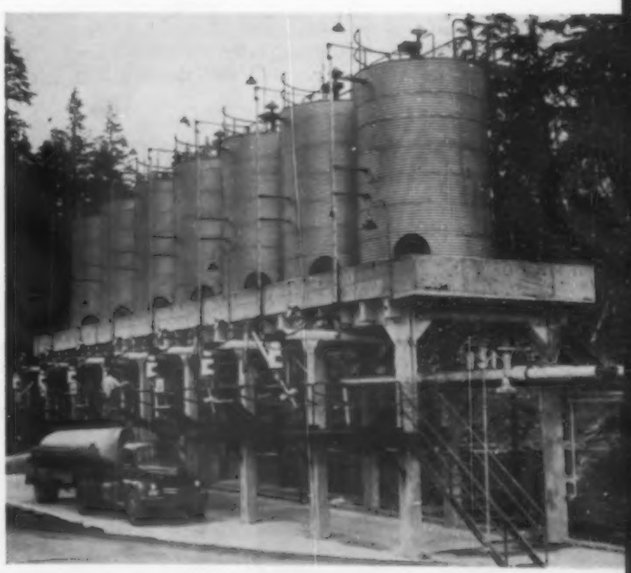
X-L Refineries Ltd., at Dawson Creek, B.C., last month completed a new vacuum unit, and increased storage capacity. The plant has a capacity of 2,800 b/cd.

At Vancouver, Standard Oil Co. of British Columbia Ltd. recently completed a lube blending plant.

Although Canada is currently plagued by unemployment and some recession in the tempo of business, oil-industry leaders anticipate a good increase in consumption this year, and another forward surge in 1959 requiring a continuation of the strong demand for capital investment in manufacturing facilities which has characterized the industry since World War II. END

More than 100 acres of trees, roots, and undergrowth had to be removed from the 400-acre site of British American Oil Co.'s new Port Moody, B.C., refinery. Because it was a virgin site, Canadian Kellogg made topographical maps and a soil survey to determine how much earth could be removed to minimize the uneven terrain and achieve the most efficient layout for the refinery.

Artist's conception of the $27 million Trafalgar refinery now being constructed for Cities Service Oil Co. Ltd., between Hamilton and Toronto.



Two-lane asphalt loading rack at Shell Oil of Canada's Shellburn refinery near Vancouver, B.C., handles seven different asphalt products. It is possible to load two trucks of the same product and four trucks of different products at the same time. The rack consists of seven 250-bbl insulated storage tanks supported on a reinforced-concrete rigid-frame structure. The complete installation was designed and supervised by the Shellburn refinery engineering department.

Exploration up sharply in western Canada

by W. A. Hiles and G. J. McMurtry

W. A. HILES received his early education in southwestern Ontario. After a period with the Canadian Navy during World War II, he entered the University of Western Ontario, which graduated him in geology in 1949. Immediately following, he joined the Royalite Oil Co. Ltd., and has been associated with its exploration, petroleum engineering, and production departments. He was appointed chief geologist in 1957.

SUMMARY

EXPLORATORY drilling in western Canada increased 18% over 1956 as 1,058 completions were recorded. Alberta with 573 and Saskatchewan with 345 together accounted for 86% of the total.

Discovery rates remained high. British Columbia led with a substantial 49%; Alberta was next, with 35%. Saskatchewan declined to 17% from 28% in 1956, while Manitoba recorded only 5%. No discoveries resulted from the four exploratory tests drilled in the Northwest Territories.

Development drilling was down for the first time since 1951—from a 1956 high of 2,383 to 1,943 completions. Saskatchewan and British Columbia, however, showed fair increases—16% and 10%, respectively; Alberta (down 36%), and Manitoba (down 29%) were responsible for the overall decline. It is unfortunate that the Pembina field, in approaching drilled-out status, recorded 466 completions fewer than last year; otherwise 1957 might have been yet another record period.

Important discoveries were made in all areas except the Territories, but those of perhaps greatest significance occurred in Alberta and British Columbia. Devonian discoveries at Innisfail, and in the Swan Hills-Virginia Hills-Kaybob areas of Alberta, together with Mississippian discoveries in the Alberta foothills, were highlights of industry news.

The number of rigs on exploratory wells remained at a level comparable to last year (Fig. 1), while those operating in proved areas were generally fewer (Fig. 2). Geophysical activity also showed a slight decline (Fig. 3) below the 1956 average.

Two new gas pipelines began deliveries during 1957. The Westcoast line from the Peace River district to southern British Columbia and the USA Pacific Northwest was completed, while the partly completed Trans-Canada pipeline was supplying gas as far east as Port Arthur, in northern Ontario, by the end of the year.

Introduction: This report considers statistics of exploratory and development drilling, and discusses highlights of industry activity—including exploration trends and significant discoveries. Brief reference is made to geophysical and drilling-rig statistics, production, and pipelines.

The region covered includes the prospective sedimentary areas of the provinces of Alberta, Saskatchewan, and Manitoba, northeastern British Columbia, the Northwest Territories, and the Yukon. Most of the region is included in the so-called "Interior Plains" area of gently westward-dipping, relatively undisturbed strata—although significant developments have taken place in the adjacent Foothills belt.

The writers wish to acknowledge the cooperation of the American Assn. of Petroleum Geologists in permitting data compiled by the Committee on Statistics of Exploratory Drilling for Western Canada to be used as the basis for this paper. For the statistics and other data tabulated in the publications of the Canadian Petroleum Assn., C. V. Myers and C. O. Nickle have also been employed. Special thanks are due Floyd K. Beach for comments on the manuscript.

General Exploratory and Development Activity: A total of 1,058 exploratory and 1,943 development wells were completed in western Canada during 1957. Compared with 899 exploratory and 2,383 development wells in 1956, an increase of 18% and a decrease of 18%, respectively, is indicated.

Major increases were recorded in exploratory drilling in both Alberta (up 20%) and Manitoba (up 70%), while Saskatchewan remained essentially unchanged. British Columbia recorded an increase in excess of 100%; four wells were completed in the Territories compared with three in 1956. Alberta with 573 exploratory completions, and Saskatchewan with 345, accounted for 86% of the western Canada total.

This was the first time since 1951 that a decline in development drilling took place compared with the previous year. Alberta was mainly responsible, down 36%—from 1,378 in 1956 to 877. Perhaps the situation may be laid at the door of the Pembina field which, in approaching drilled-out status, recorded only 389 completions against 855 in

C. J. McMURTRY was graduated by the University of Saskatchewan, with the degree of bachelor of geological engineering. He has been with the exploration department of the Royalite Oil Co. Ltd. since completion of his studies in 1955.

Computer members of an Imperial seismic party near Cochrane, Alberta, ready for skiing after a day's work (Imperial photo).

1956, at the same time that there was no comparable area of development replacing it. Saskatchewan enjoyed an increase of 16% —882 to 761; British Columbia was up 10% —from 30 to 33. Manitoba declined from 210 to 150, the result of lack of new discoveries. A single development well was drilled in the Territories. As in the case of exploratory drilling, Alberta and Saskatchewan accounted for the bulk of development work, 91%.

A total of 242 drilling rigs was reported active in western Canada at the end of 1957, compared with 286 at the end of the previous year. This represents a decrease of 15%, which was due entiredy to a decline in development drilling (Fig. 2). The number of rigs operating on exploratory projects showed a 20% increase over the same period (Fig. 1).

Geophysical activity also showed a slight decline below the 1956 level (Fig. 3). Crews active at year-end 1957 totaled 121, compared with 136 at the same time in 1956.

New markets for natural gas were in the news in 1957, as the Westcoast Transmission line from northeastern Bristish Columbia was completed, and deliveries began to the Vancouver area and the USA Pacific Northwest. The Trans-Canada pipeline was partly completed, and Alberta gas is now being consumed as far east as Port Arthur, in northern Ontario. Two other proposals to export gas from Alberta southward are currently under consideration by government agencies.

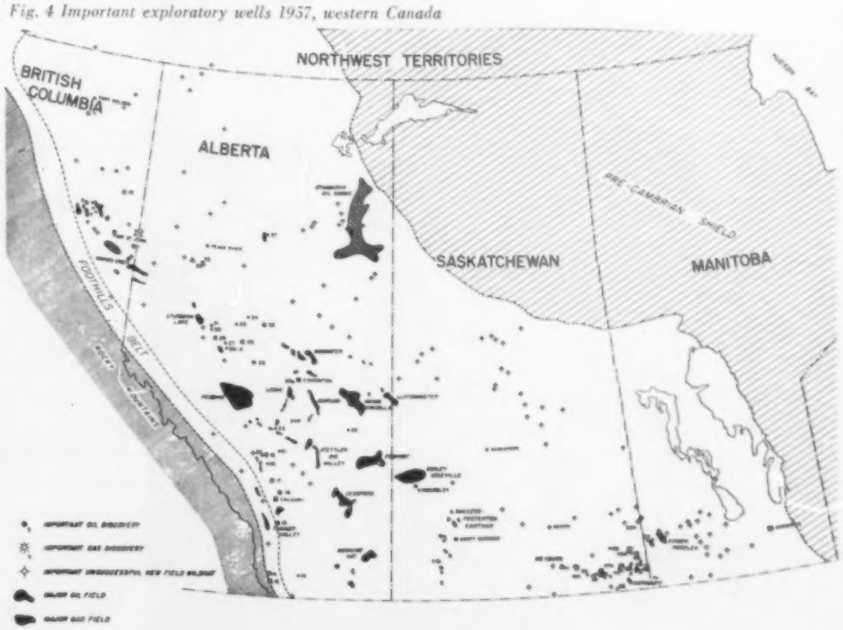
Western Canadian crude production, notably that in Alberta, was handicapped by severe market proration. Wells in this province are producing at less than 50% of their capacity. The Suez crisis created a temporary partial alleviation of this condition; but USA import restrictions, together with an oversupply of domestic refined products toward the end of the year, made further cutbacks necessary.

Increased land activity took place in the Northwest Territories and the Yukon—with the latter recording the spudding of its first well (currently suspended) in the Peel Plateau region. In the remainder of the subject area, much of the prospective land continued to be held under lease or reservation.

Alberta

Alberta was responsible for 54% of Western Canada exploratory activity, and 45% of the development activity. Slightly more than half of the completions (Fig. 5) had as their objective strata of Devonian age and older; Mississippian and Permo-Pennsylvanian tests; and wells bottomed in the Mesozoic accounted for approximately equal portions of the remainder. A total of 63 wells, drilled mostly in the northern part of the province, reached the pre-Cambrian. De-

Fig. 4 Important exploratory wells 1957, western Canada



Seismic crew on a plane-table survey in the Alberta foothills (Royalite photo).

velopment drilling was carried out at widespread localities—with the greatest activity in the Pembina, Keystone, Joffre, Wainwright, Bellshill Lake, Bonnyville, Harmattan, and Sturgeon Lake fields.

Discoveries: A total of 113 oil (20% of the total exploratory tests) and 90 gas (16%) discoveries were made in Alberta during 1957. This is comparable to 92 and 80, respectively, in 1956. Many of these represent extensions to known productive areas; some are small and of little significance; and still others require further development before their ultimate importance can be appreciated. The more important, together with those elsewhere in western Canada, have been listed with pertinent data in Table II—including index numbers corresponding to oil and gas wells shown in Fig. 4. Only those which appear to be of greatest significance, however, will be discussed.

Four areas might be considered to highlight 1957 discovery. In the Swan Hills-Virginia Hills-Kaybob area—centered approximately 120 miles northwest of Edmonton, in essentially unexplored territory—five isolated discoveries of significance were made. Four of these, Cal. Standard-B.A. Iosegun #7-33 (7-33-63-19 W5), Phillips

TABLE I

WELL SUMMARY—WESTERN CANADA—1956-57

AREA	OIL		GAS		DRY		TOTAL	
	1956	1957	1956	1957	1956	1957	1956	1957
Alberta								
Exploratory	92	113	80	90	306	370	478	573
Development	1,255	761	54	45	69	71	1,378	877
Total	1,347	874	134	135	375	441	1,856	1,450
Saskatchewan								
Exploratory	91	55	5	5	251	285	347	345
Development	693	798	7	11	61	73	761	882
Total	784	853	12	16	312	358	1,108	1,227
Manitoba								
Exploratory	4	4	—	—	40	71	44	75
Development	187	113	—	—	23	37	210	150
Total	191	117	—	—	63	108	254	225
British Columbia								
Exploratory	—	6	11	24	16	31	27	61
Development	7	2	23	19	—	12	30	33
Total	7	8	34	43	16	43	57	94
Northwest Territories								
Exploratory	—	—	—	—	3	4	3	4
Development	4	—	—	1	—	—	4	1
Total	4	—	—	1	3	4	7	5
Western Canada								
Exploratory	187	178	96	119	615	761	899	1,058
Development	2,146	1,674	84	76	153	193	2,383	1,943
Total	2,333	1,852	180	195	769	974	3,282	3,001

Fig. 1

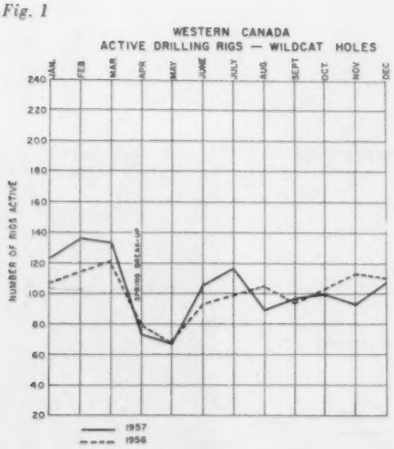

WESTERN CANADA
ACTIVE DRILLING RIGS — WILDCAT HOLES
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
NUMBER OF RIGS ACTIVE
SPRING BREAK-UP
1957
1956

Fig. 2

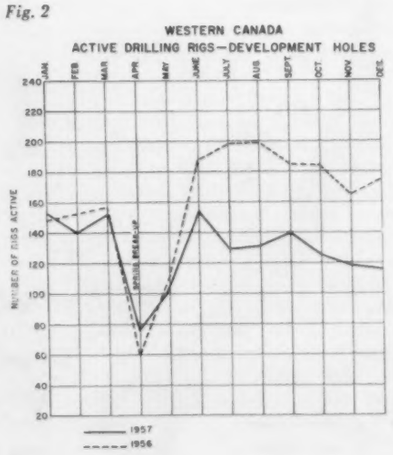
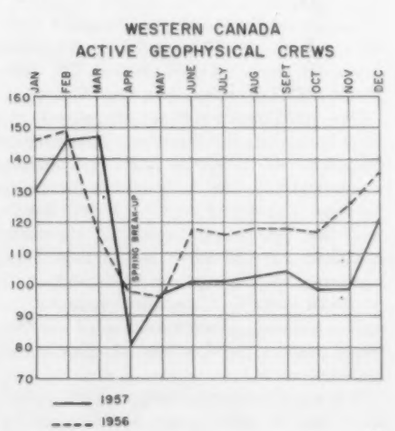


Fig. 3



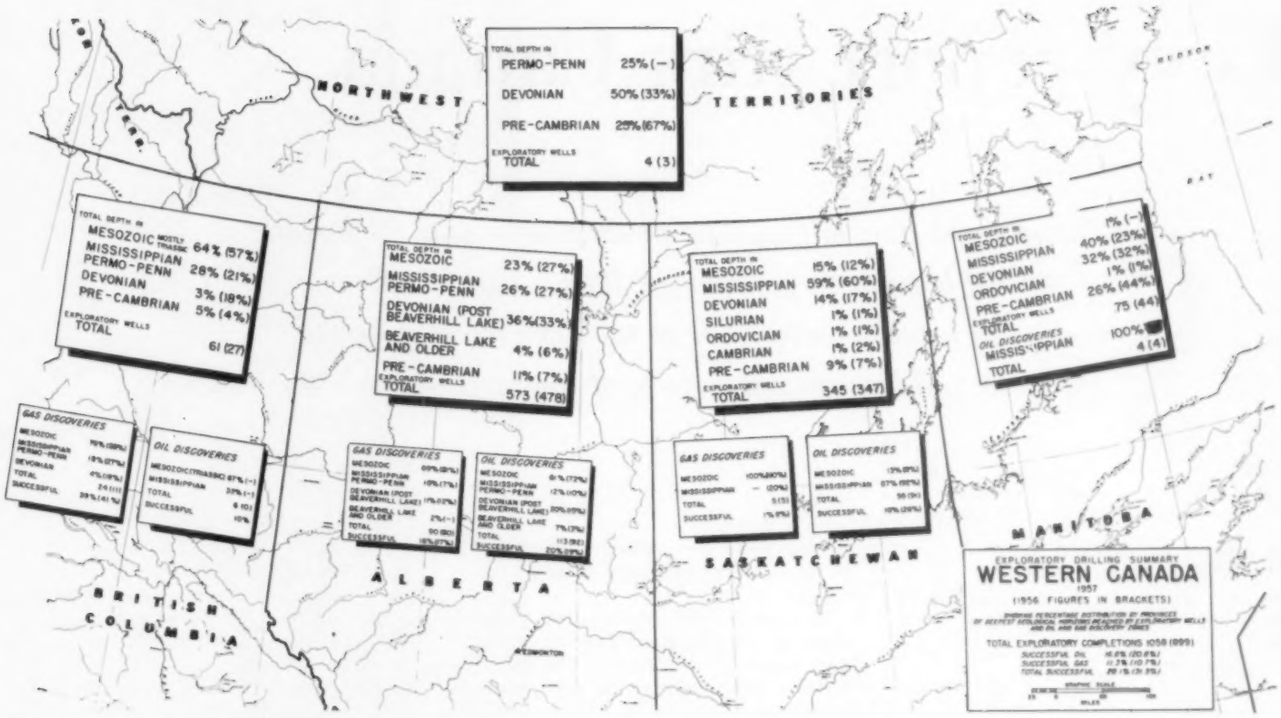


Fig. 5

Kaybob #A-1 (7-22-64-19 W5), Home-Union-Hudson's Bay Virginia Hills #9-20 (9-20-65-13 W5), and Home et al. Regent Edith Lake #11-19 (11-19-67-10 W5) found oil; while the fifth, Mobil Whitecourt #12-13 (13-12-61-12 W5) discovered wet gas. The producing horizon, the Slave Point formation, is at the base of the Beaverhill Lake group (Upper Devonian). One of the more interesting characteristics of this area to date has been the high incidence of discovery to dry holes, particularly in view of the fact that the Beaverhill Lake had been previously an insignificant producing horizon. Reservoir characteristics appear to be good; pay thicknesses are substantial; and crude is light-gravity. This area will no doubt see increased action in 1958.

At Innisfail, some 60 miles north of Calgary, White Rose-C. & E. Innisfail #1-16 (1-16-35-1 W5) discovered a major oil reservoir in Leduc (Upper Devonian) reef. This was the first important reef discovery in some time, and does not appear to be located on any previously established trend. Since discovery, this Innisfail field has been extensively developed, and to date 28 producers on 80-acre spacing have been completed.

The other two important areas are located at widely separated localities in the Alberta foothills. In the extreme south of the province, a few miles west of the Pincher Creek producing trend, Shell Waterton #1 (4-21-4-1 W5) and Texaco Castle River #A-3-4 (3-4-6-2 W5) both produced gas at substantial rates from the Mississippian. These wells are about 11 miles apart, but may be located in a common reservoir. Subsequent development has indicated significant areal extent. Some 250 miles northwestward, Triad-B.A. et al.-Stolberg #6-10 (6-10-42-15 W5) and B.A. et al.-Lovett River #12-30 (12-30-46-18 W5) are also indicated to be substantial Mississippian gas producers, but have not to date been fully evaluated. In spite of the considerable depth involved, these strikes should encourage increased "disturbed belt" exploration.

In the Red Earth area, where "granite wash" oil production was encountered in 1956, Union Red Earth #2-4 (2-4-88-8 W5) has found what is apparently a new pool, three miles northeast of the original discovery. Some development around the 1956

(Continued on page 120)

Workmen at a Mobil Oil of Canada well in Duhamel field, Alberta, change rams on a blowout preventer below the derrick floor: Rams are valves which can be shut over pipes to prevent well from blowing out (Mobil photo).

Levy report stirs Canada

The recent decline in Canadian production — plus the threat of 200,000 b/d shut-in potential by 1960 — has stimulated the search for new outlets. The recent Levy report points at Montreal, and has aroused a storm of controversy within the industry.

RECENTLY the report by Walter J. Levy, petroleum consultant from New York, has been released by the group of smaller producing companies which commissioned it. The report itself is long and detailed, but in summary it says:

1. Since 1954, the rate of development of Canadian reserves and productive capacity has exceeded the rate of growth in requirements with the market areas in which it has established itself to the point where the producing industry now operates at 50% of capacity. The incentives of future resource development are, therefore, threatened.

2. The near-term prospect (to 1960) of requirements for Canadian crude, although they could be favorable, are beclouded by the present retardation of business activity and, more importantly, the uncertainties associated with US import policy. This could mean that the full effect of favorable trends might not be realized till early 1960's.

3. Beyond that date, the middle-term prospects (1960+ to 1965) are unfavorable unless the present marketing perimeter can be extended into the US or to Montreal. Extension into the US will be difficult due to (a) the uncertainties associated with US import policy and (b) intensified competition with the main stream of USA crudes or low-cost foreign crudes resulting from the commercial policies of integrated USA oil companies. The commercial policies of the integrated international US companies will likewise oppose the extension to Montreal.

4. Long-term prospects of requirements for Canadian crude in USA are favorable, as are long-term prospects for levels of reserves and production which could be obtained in the light of Canada's physical resources, provided the right incentives are present (in the near and middle terms).

5. The balance struck—after considering all the aspects—will determine whether, despite the fact that the Montreal market is not an obvious direction of expansion, "the Canadian producing industry might have to seek relief where its own national policies could prove effective. This would, in fact, mean a penetration of the Montreal market.

In a speech before the Security Analysts Assn., of Toronto, given January 24, C. S. Lee, president of Western Decalta Petroleum Ltd., analyzed the economic rationale of a pipeline to Montreal which would be sufficient to supply the market there. He estimated that western Canadian crude can be laid down in Montreal for $3.15 to $3.30 per barrel (compared with the official delivery price of Venezuelan crude of $3.36 to $3.43). This could be accomplished in several ways: (1) expansion of Interprovincial Pipe Line facilities at an expected expenditure of about $50 million; or (2) the construction, beginning in 1959, of a new 34-in., 30-in., and 26-in. pipe line parallel to existing facilities and extended to Montreal. Cost was estimated at $400 million. The system would deliver about 312,000 b/d to Montreal. It would be capable of 360,000 b/d expansion later on, while the mentioned expansions of Interprovincial Pipe Line would be its ultimate expanded capacity. The third case cited by Mr. Lee is an entirely new 30-in. pipeline system from Edmonton to Montreal—paralleling existing IInterprovincial facilities, and costing about $350,000,000. It would be completed about 1961, and deliver 312,000 b/d to Montreal. It, too, could be expanded.

Mr. Lee further pointed out that, by using Canadian crude in eastern Canadian markets, the foreign-trade deficit could be reduced by $300 million to $500 million per year between now and 1965. In addition to the defense considerations involved in having Canada supplied with Canadian sources, Mr. Lee pointed out the incentive provided to oil exploration and development by the opening of such additional markets and the increased nationwide employment resulting.

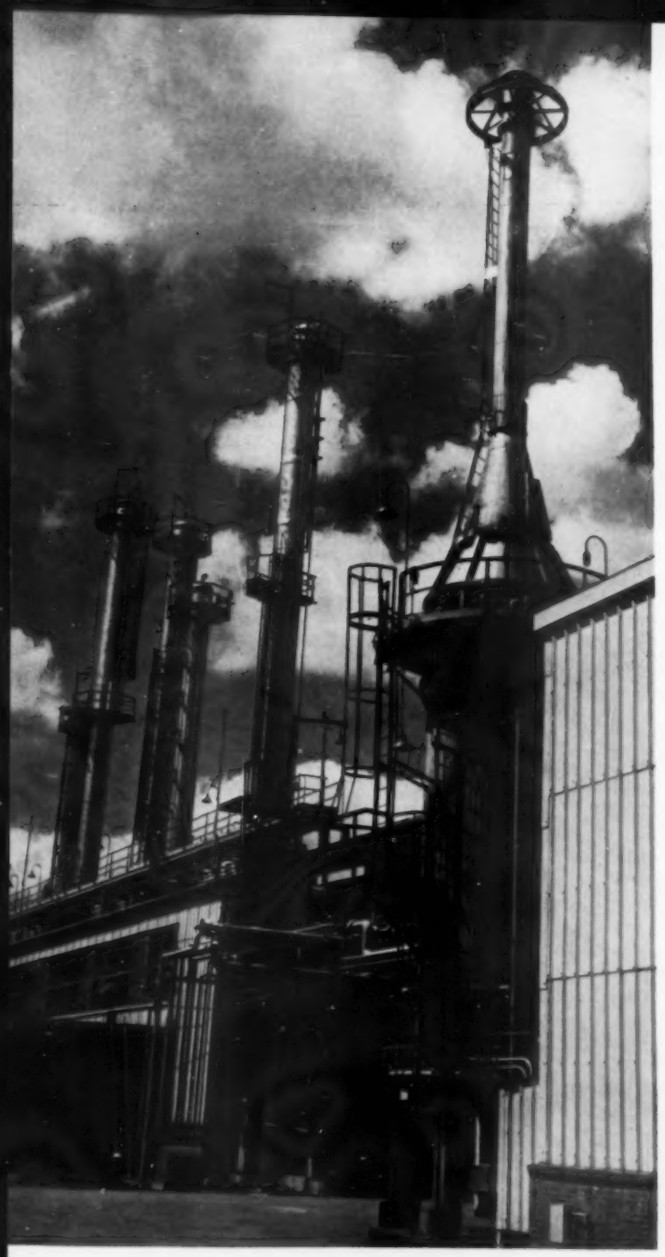
Major-company spokesmen expressed considerably less enthusiasm for the idea. Among the objections cited were the possibility of an international crude-price decline, which would leave the pipeline to be undercut by imports. The possibility of restrictions on imports also aroused Montreal refiners, many of whom have built their plants on the expectation of operating on foreign crude. The imposition of import restrictions would, of course, operate to their disadvantage.

One of the principal assumptions of the Levy report is that commercial considerations would lead the major international companies operating in Canada to oppose the line——since they can more advantageously purchase crude from their suppliers outside of Canada, such as Indonesia and Venezuela where they can buy 100% of their own crude instead of being forced to take prorated crude from the pipelines on east or west coasts of Canada.

In rebuttal, and as an example of their willingness to take Canadian crude in preference to their own imported crude supplies, however, the majors point to the fact that Imperial provided financial backing for both the Interprovincial and Trans Mountain lines. Interprovincial "backed out" Venezuelan imports into the Great Lakes region when it was completed to there; as well as backing out crude from Carter Oil Co., an affiliate of Imperial through Standard Oil Co. (New Jersey). The Trans Mountain line equally backed out imports for Imperial refineries in British Columbia from affiliated company sources.

The company spokesmen—anticipating that the United States market will be available to Canadian crude shortly in sufficient amounts—suggest instead of a pipeline that Ontario markets be expanded—utilizing existing pipeline connections. They also suggest that the West Coast market in the USA could be expanded by some arrangement; for example, by exchange of Sumatra crude for Canadian, or some similar trade.

In any case, the coming months will be decisive ones for Canada, and the decisions made will be long-lasting. It is estimated that, if import restrictions are put on to facilitate the building of a new Edmonton-Montreal line, they will have to remain nearly 20 years to enable satisfactory payout for the line's cost. END



Part of petrochemical facilities at Shell Oil Co. of Canada's Montreal East refinery: At same location is an epoxy-type resin plant and dual-purpose alkylation plant for manufacture of detergent alkylate and high-octane gasoline components (Shell of Canada photo).

Petrochemicals

Half of Canada's output of industrial chemicals is produced from petroleum in plants representing a half-billion-dollar investment.

THE petrochemicals division of the oil industry in Canada has been expanding at an explosive rate in recent years. Investment now exceeds a half-billion dollars and the annual output of 50 petrochemicals is contributing substantially to the strength of the Canadian dollar by decreasing the importation of foreign products.

In 1947, production of petrochemicals in Canada was valued at $24 million, and in 1956 this had grown to $143.6 million, according to data gathered by Dr. John Davis for the Royal Commission on Canada's Economic Prospects.

Half of the current investment in the chemical industry in Canada now is going into petrochemicals. Output of the industry represents 50% of all industrial chemicals and 80% of all organics produced in the dominion. In 1939, organics comprised only 20% of Canada's chemical output. This now has risen to 40% to 45%—mostly in the field of synthetic fibers.

Since 1950, the diversification of the petrochemical industry in Canada has been impressive. Manufacturers have built plants which give flexibility in meetings changing market requirements. Facilities have been expanded for the production of such items as formaldehyde, butanol, isobutanol, propanol, propylene glycol, ethylene glycol, and pentaerythritol—to mention only a few. New chemicals produced since 1950 include polyethylene, carbon black, polyesters, liquid sulfur dioxide, fluorinated hydrocarbons, lignosol, nylon intermediates, lubricating-oil additives, alkyl aryl compounds, tetraethyl lead, methylethylketone, and urea. The industry began manufacturing styrene and other components of synthetic rubber during World War II.

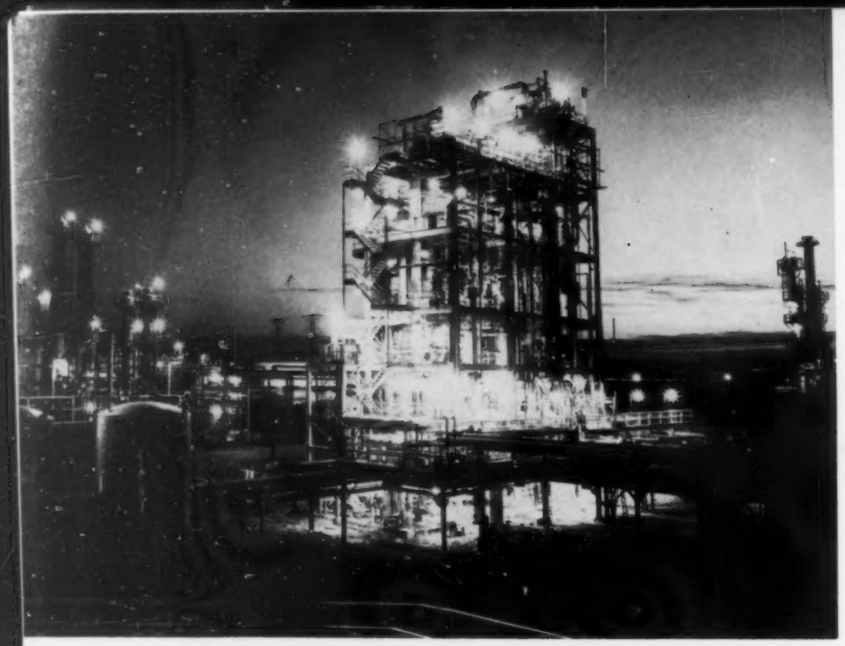
Petrochemicals in Canada are produced from natural gas on the prairies, and from refinery effluents in the large centers at Sarnia, Ont., and at Montreal. In the refining centers, oil companies are selling their effluent gases—in some instances to specialized petrochemical companies, and in other instances, they are producing the chemical intermediates for resale to other companies.

New investment in petrochemical facilities in 1957 is estimated by Dr. Davis at $136 million, as compared with $123 million in 1956. Plants now under construction will cost about $100 million when completed.

Imperial Oil Ltd. is currently one of the largest builders of petrochemical facilities in Canada. During 1957, the company completed a $38 million plant at Sarnia for the production of detergent alkylates. Output of the plant is to be 30 million pounds per year. It will take care of the dominion's requirements of dedecyl benzene, and also will produce tripropylene and tetrapropylene, as well as alkyl aromatics. A description of this new plant will be published in an early issue of *World Petroleum*.

To supplement the detergent plant, Imperial now is spending an additional $25 million at Sarnia to produce a wide range of intermediates based on ethylene.

Also in the Sarnia area, Canadian Oil Companies Ltd. completed a Udex unit last



Night view of oxide reaction unit at Carbide Chemicals Co. Montreal East plant, where ethylene is converted to ethylene oxide (Carbide Chemicals photo).

July for the production of aromatics. Benzene, toluene, and xylenes are available for sale as such, or for blending into motor fuels as octane requirements may dictate.

Polymer Corp., pioneer synthetic-rubber producer in Canada, is expanding at Sarnia, and plans a butadiene plant in Alberta based on extraction of liquid hydrocarbons from enlarged production of natural gas for Trans-Canada.

Dow Chemical of Canada Ltd. has been spending an additional $10 million to expand its Sarnia plant, which produces ethylene intermediates and plastics.

Much of the ethylene-based expansion in Canada has been required by the soaring consumption of polyethylene for plastics. In 1953, Canada consumed four million pounds of polyethylene. By 1955, this demand had quadrupled, and in 1957 estimated consumption was up nearly eightfold. Increase in 1957 over 1956 was 30% —to 31 million pounds from 22.7 million.

DuPont Co. of Canada is reported preparing to build a polyethylene plant in Canada. Canadian Industries Ltd. is a large producer at Edmonton, where plans are afoot to expand output to double its present rate. Union Carbide recently completed its Montreal plant and, as mentioned above, Dow Chemical is a large producer at Sarnia.

Not all of the petrochemical plants are based on gas. At Millhaven, Ont., Canadian Industries Ltd. completed in February the first anhydrous-ammonia plant in Canada to use fuel oil as raw material. The new $9 million plant has a daily capacity of 200 tons. It employs The Texas Co.'s process. It was built adjacent to the company's terylene polyester fiber plant on Lake Ontario.

Last summer, Shell disclosed plans to build Canada's first plant to produce epoxy-type resins. The plant, situated at Montreal East, has since been completed at a cost of $1 million. Capacity is more than sufficient to produce Eon[1] resins to supply Canada's demand for these products.

The plant, designed by Shell's own engineers, was constructed by Refinery Engineering Ltd., of Toronto.

Epon resins are made by condensation polymerization of bisphenol-A and epichlorohydrin, two petroleum-based chemicals produced by Shell. These versatile resins are finding a wide variety of uses in industry. They form the basis of surface coatings which combine easy applications with remarkable hardness, gloss, washability, adhesion, chemical and wear resistance, and flexibility. Because of these advantages, they are widely used in floor finishes, household-appliance primers and topcoats, furniture finishes, metal-decorating enamels, can-and-drum coatings and linings, maintenance paints, and automotive primers. Epon resins are also finding increasing use in such applications as the protection of delicate electronic components.

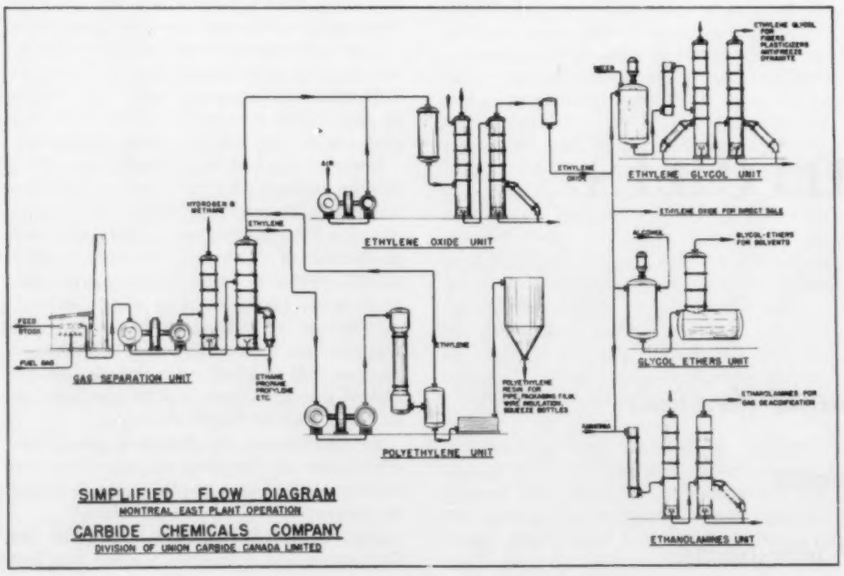
Completion of the Montreal East Epon resin plant is the latest development in Shell's program to expand its Canadian chemical manufacturing facilities. Recently, at the Montreal East chemical plant, a new dual-purpose alkylation plant commenced manufacture of detergent alkylate and high-octane gasoline components for the production of superior internal-combustion fuels. The plant design is the result of Universal Oil Products' experience with hydrofluoric-acid type gasoline alkylation plants and Shell's worldwide experience in the manufacture of detergents. Refinery Engineering Ltd., of Toronto, was responsible for mechanical engineering and construction. The plant is capable of producing 400 b/d of detergent alkylate and 1,500 b/d of gasoline alkylate. Detergent alkylate is synthesized by the alkylation of petroleum or coal-based benzene and special polymers produced in Shell's refinery. Gasoline alkylate is produced for the refinery from isobutane and butylenes originating from cracking operations.

By the summer of 1958, a 640 b/d plant will be completed at Shellburn refinery (Vancouver, B.C.) for the manufacture of special boiling-point naphthas and petroleum solvents. This versatile plant is designed to produce both aliphatic and aromatic petroleum-based solvents and special fuels. The design contractor was Fluor Corp. of Canada Ltd., and construction is being carried out by the Shellburn refinery construction group.

Construction of an agricultural chemical formulating plant at Simcoe, Ont., was commenced late in 1957. This plant will formulate granular and regular dusts, wettable powders, and seed dressings. Scheduled for completion by the summer of 1958, the plant will manufacture pesticides from such widely known Shell agricultural chemicals as aldrin, dieldrin, endrin, phosdrin insecticide, and nemagon soil fumigant.

The above new additions supplement Shell's Canadian chemical manufacturing

[1] Registered trade name.



facilities at Montreal East which produce all grades of isopropyl alcohol, acetone, secondary butyl alcohol, methylethylketone, and various byproduct ethers and polymers. In addition, the Jumping Pound, Alberta, plant has been producing elemental sulfur since 1953.

Canada is currently a large importer of sulfur. In 1956, for example, domestic production was 37,200 tons, and imports totaled 474,100 tons. National capacity in 1957 was up to 125,200 tons per year, and by 1965 it is estimated Alberta will be able to produce a million tons per year. Much of the gas from western Canada is sour, so that sulfur must be removed before sale. Plants for this purpose are operated by Shell, Royalite, and British-American, in Alberta, and by Jefferson Lake Sulphur Co., in British Columbia, which was scheduled to complete a 150,000-ton-per-year plant early this year to process gas for Westcoast Transmission Co. Cost of transporting sulfur from Alberta to the East will be a retarding factor in development of sulfur production. Only sulfur currently being produced in eastern Canada is from the Laurentide Chemical & Sulphur Co. plant at Montreal East, which has the capacity to produce 33,000 tons per year from gases concentrated by Carbide Chemicals Co. from Montreal refineries.

An important new addition to Canada's petrochemical-producing capacity is the Carbide Chemicals Co. Montreal plant, which was officially opened on October 2 last. Carbide is a division of Union Carbide Canada Ltd., which operates 30 plants of various types in Canada. The plant processes effluent gases from nearby refineries to produce about 30 products—including ethylene, polyethylene, ethylene oxide, ethylene glycol, ethanolamines, polyglycols, and glycol ethers.

The plant is currently being expanded, and will produce a number of other new products when construction work is completed this year. Among the new products will be higher molecular-weight polyethylene glycols (Carbowax compounds) and several polyalkylene glycols (Uncon lubricants).

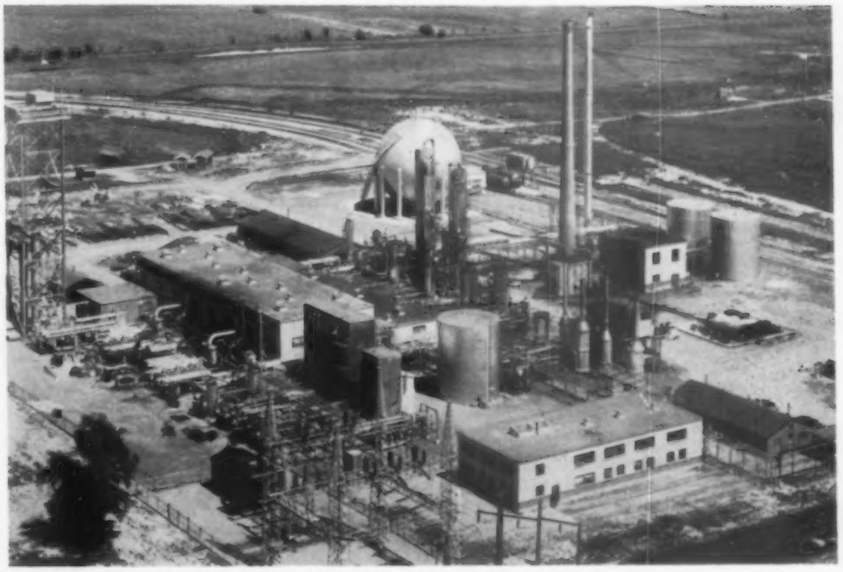
End-product uses of the Carbide plant include latex paints, liquid starches, detergents, antifreeze, dehydrators, desulfurizers, brake and shock absorber fluids, synthetic lubricants, textiles, and plastics.

Mixed refinery gases received by Carbide are fractionated and purified. Acid gases are pumped to Laurentide for sulfur recovery, and the pure ethylene is retained as raw material. Ethylene is polymerized by Carbide at pressures reaching 1,000 atmospheres. Ethylene oxide is produced by the Carbide process, in which air and ethylene are passed over a silver catalyst. The finished oxide is a building block used in many finished products.

Carbide's engineering department designed the plant. Angus Robertson Co., Ltd. and Foundation Co. of Canada Ltd. were general contractors, and structural steel was erected by Dominion Bridge Co. Ltd.

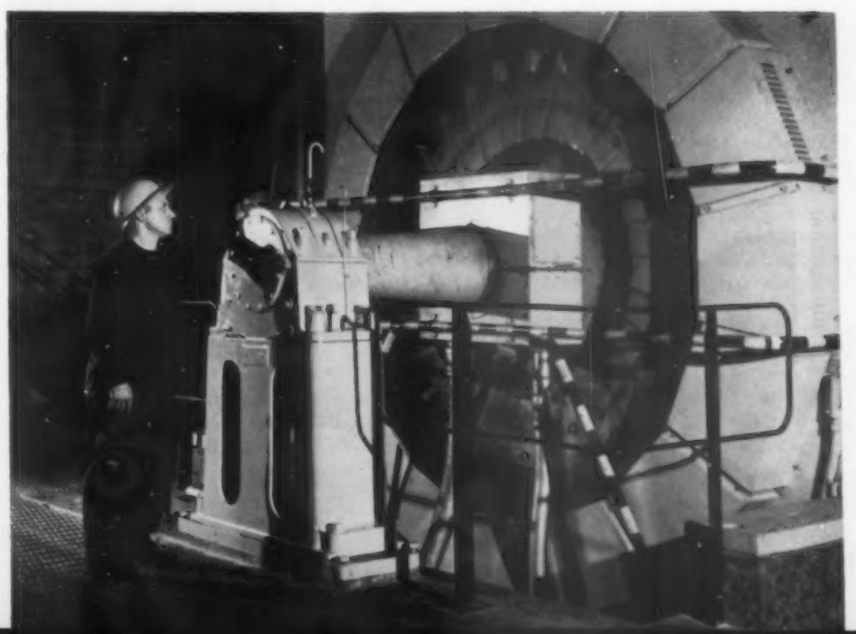
END

Processing units of Imperial Oil Ltd.'s new detergent alkylate plant, at Sarnia, Ont. (Imperial photo).



Aerial view of $9 million ammonia plant of Canadian Industries Ltd., at Millhaven, Ont.: Plant's capacity is 200 tons of anhydrous ammonia per day (Canadian Industries photo).

Operator takes temperature readings of bearings at Canadian Industries Ltd. ammonia plant at Millhaven, Ont. Cooper Bessemer supplied two LM type 6,000-hp compressors for this plant, which compresses air, nitrogen, synthesis gas, and recycle gas to elevated operating pressures. Air suction is at 14.6 psia and discharge at 655 psia; nitrogen suction at 15.7 psia and discharge 400 psia. Synthesis gas is picked up at 345 psia and discharged at 4,070 psia. Recycle-gas suction is 3,955 psia and discharge 4,315 psia (Canadian Industries photo).



Work proceeds throughout winter to complete on time the $8 million 106-mile Peace River pipeline owned by major Sturgeon Lake interests. Line is operated by Britamoil Pipeline Co. (Shell photo).

Sub-zero welding on Peace River pipeline connecting Alberta's Sturgeon Lake field with Trans-Mountain Oil Pipeline and major West Coast markets: Completed early in 1956, line's optimum capacity of 32,500 b/d was designed for maximum 57,600 b/d without looping (Shell photo).

Canadian pipeline deliveries higher

Increased demand for Canadian crude in St. Paul and the Suez crisis aid major trunk lines to increase traffic.

Oil pipeline expansion in Canada during 1957 was carried on at a normal pace. The two major trunk-line systems made capital expenditures totaling $56.2 million, and necessary expansion of Pembina and Westspur feeder systems added another $10 million to the investment in oil lines.

Gross oil receipts by Canadian trunk pipelines in 1957 totaled 416,898,490 bbl, compared with 373,542,189 bbl in 1956 and 285,110,261 bbl in 1955. Net deliveries by trunk pipelines totaled 288,635,631 bbl after deducting deliveries from one carrier to another. Net deliveries in 1956 totaled 268,505,095, and in 1955 the total was 212,828,540.

Gathering lines received a net of 163,666,927 bbl in 1957 for delivery to other carriers or direct to consumers. Receipts in 1956 totaled 153,519,204 bbl.

Operating revenue of all lines in 1957 was $92.1 million, compared with $78.2 million in 1956.

Interprovincial Pipe Line Co. added $23 million to its capital investment in 1957 in a continuation of its looping program in the west and the extension of its main line on the east from Sarnia to Toronto.

The 156-mile extension of 20-in. line now serves British American Oil Co.'s 55,000 b/d refinery at Clarkson, and McColl Frontenac Oil Co. Ltd. (Regent) 20,000 b/d refinery at Port Credit. With a present capacity of 111,000 b/d, the Toronto extension will be adequate to take care of the new 20,000 b/d Cities Service refinery to be completed early next year and the projected Shell refinery which is expected to be built in 1960. Capacity of the line can be increased by the addition of new pumps. The 1958 extension involved construction of a 3,800-hp pump station at Sarnia.

Looping in the west during 1957 included 111 miles of 24- and 26-in. pipe in Saskatchewan, Minnesota, and Wisconsin. Pumping capacity was expanded by the installation of additional horsepower at five western stations and the completion of a new remote-controlled station at Indian River, Mich. This new push-button station is operated from Superior.

Interprovincial's construction program in 1958 involves the building of another automatic pump station at Gould City, Mich., which will also be controlled from Superior. Another pump station will be built at Bay City Mich. An additional 82 miles of 24-in. loop will be laid between Edmonton and Regina, and 2,000-hp diesel pumping units will be installed at Regina, Glenavon, Cromer, and Glenboro. Cost of the 1958 program—including completion of jobs started previously—totals $12.3 million. Capacity of various segments of the line at the end of the year will be: Edmonton-Regina, 275,000 b/d; Regina-Cromer, 335,000 b/d; Cromer-Gretna, 376,000 b/d; Gretna-Clearbrook, 352,000 b/d; Clearbrook-Superior, 346,000 b/d; Superior-Sarnia, 258,000 b/d; and Sarnia-Toronto, 110,000 b/d.

Interprovincial oil deliveries rose 3% in 1957, to 99.9 million barrels; but barrel-mile traffic dropped to 95 billion in 1957 from 100.5 billion in 1956. This was due to expanded production, in Saskatchewan and Manitoba, which was pumped eastward at the expense of Alberta operations.

Most of the increase in Interprovincial deliveries was to USA refineries which took 20.7 million barrels, compared with 16.9 million the previous year. The increase was to St. Paul, Minn., which took 13.6 million barrels. Michigan deliveries were steady at 1.7 million barrels. Ontario plants increased their take by 900,000 bbl, to 41.4 million barrels; but tanker loadings at Superior dropped 1.5 million barrels, to 4.1 million. Western Canada plant deliveries were unchanged at 33.7 million barrels.

The drop in barrel-mile traffic cut Interprovincial's operating income by $669,000 in 1957; but net profit fell only $176,000, to $9,544,661. All funds for expansion were internally generated, so that interest charges on long-term debt continued to drop. Decrease in 1957 was $252,695. Depreciated value of the system at the end of the year was $222.6 million and long-term debt $143.7 million. The company's 3.5% to 4% bonds are due between 1970 and 1974.

Net earnings per common share in 1957 totaled $1.89, compared with $1.92 in 1956.

Dividend payout was increased to $1.40 from $1.10.

Trans Mountain Oil Pipe Line Co. enjoyed a sharp increase in traffic during the first half of 1957 as a result of the Suez crisis. The line was operated at capacity during the 6-month period—throughput averaging 183,316 b/d. In the month of May, offshore loading at the Westridge terminal for delivery to California refiners averaged 60,000 b/d.

During the latter half of the year, the California business was lost to Middle East and Latin American producers as a result of the drop in ocean freight rates. In addition, warm weather in the early months of the winter and other factors reduced demand in the Pacific Northwest and in British Columbia—with the result that fourth-quarter deliveries were down to 97,580 b/d. Average for the entire year was 154,891 b/d, an increase of 20% over 1956. Deliveries during the early months of 1958 were at the 100,000 b/d level.

Trans Mountain began a long-range construction program in 1957 looking forward to future requirements of its customers. Early in the year, permanent pumping stations were completed at Jasper and Gainford, which raised capacity of the line to 200,000 b/d. Later in the year, a permanent station was built at Sumas, B.C., and temporary stations were installed at Albreda and Kingsvale, B.C., and at Niton, Alberta. These were completed in August. Two 50-mile 30-in. loops added another 50,000 b/d to capacity in 1957. One loop was laid west of Edson to increase pumping capacity across the Rocky Mountains and the second loop, east of Kamloops, to improve pumping over the coastal range of mountains. Cost of the 1957 improvements was $33.2 million. This year the company will complete improvements at the Westridge marine terminal, permitting the loading of 60,000 dwt supertankers. Originally the terminal was designed for 16,000-ton vessels.

Trans Mountain earned $8.3 million—$5.52 per share—in 1957, compared with $6.99 million—$4.65 per share—in 1956. Dividend paid was $2.00 per share, compared with $1.00 in 1956—the first paid. The line earned its first profit, $2.05 per share, in 1955, after two years of small losses while the throughput was being built to 39,787 b/d in 1955 and 83,982 b/d in 1956, from 21,096 b/d in 1954.

Of the three major oil-gathering pipeline systems, two found it necessary to make substantial additions in 1957. Serving older fields, the Imperial system was not greatly changed during the year; but Pembina Pipe Line Ltd., in Alberta, and Westspur Pipe Line Co., in Saskatchewan, both continued to expand to care for greated production.

Originally built in 1956 as a 109-mile 12-in. trunk line, the Westspur system also included 109 miles of gathering lines operated by its subsidiary, Producers Pipelines Ltd. The line gathers crude from Steelman, Midale, Alida, Frobisher, Hastings, and Nottingham fields, and delivers the oil to Interprovincial at Cromer, Man. Capacity at the beginning of 1956 was about 40,000 b/d.

Rapid expansion of the southern Saskatchewan fields required that line capacity be tripled during 1957, to 120,000 b/d. This was accomplished by the laying of over 132 miles of line, of which a major part was a 75-mile loop of 16-in. main line at the eastern end of the system. The Steelman portion of the system also was expanded by the laying of 40 miles of smaller-diameter pipe. Total main-line and gathering lines was about 350 miles at the end of the year.

In its third year of operation, Pembina Pipe Line Ltd. continued its expansion to meet peak summer requirements of the field it serves. In 1956, the system was virtually doubled—gathering mileage rising to 325 miles from 157. Main line was 70 miles from field to Edmonton.

In 1957, 32 miles of 16-in. main-line loop was laid from Calman to Edmonton. This increased the former peak delivery capacity in summer to 153,000 b/d from 126,000 b/d. This loop now appears unnecessary, and may be sold for gas transmission. The gathering system was extended 116 miles in 1957 to serve additional wells—bringing total construction for the year to 148 miles.

Pembina pipeline now serves 2,113 wells through 344 tank batteries. Deliveries in 1957 averaged 106,000 b/d—an increase of 20% over 1956, but less than the anticipated throughput which had been forecast at 125,000 b/d. Net profit in 1957 was $1,095,079, or 62 cents per common share. In 1956, profit was 63 cents per share.

Two major oil pipeline projects are being considered in western Canada at the moment. Westcoast Transmission Co. has made plans to lay a 650-mile crude line from the Peace River area in British Columbia to Vancouver. The line would parallel the company's gas line completed last year. Cost of the project would be about $100 million. Completion would require about 1½ years. At the present time, crude production in the Boundary Lake field and nearby areas is not adequate to support such a costly line, but producers are optimistic that additional important reserves will be discovered.

Another project for the future is the proposed 280-mile 16-in. Bituminous Oil Pipeline Co. line from the Athabasca tar sands to Alberta. Royalite Oil Co. Ltd. and others are proceeding with a long-range project in the tar sands, and other companies have acquired acreage for development if demand requires and recovery techniques are perfected to an economic commercial state.

To dramatize the present plight of Alberta producers, Pacific Petroleums Ltd. and Canadian Homestead Oils Ltd. have organized East Coast Transmission Co. Ltd., with the announced purpose of building a second transcontinental crude line—from Alberta to Montreal. Lack of outlet for potential oil production in Alberta has created ogitation for means of capturing the expanding Montreal market totaling more than 250,000 b/d, which is served by Latin American and Middle Eastern fields.

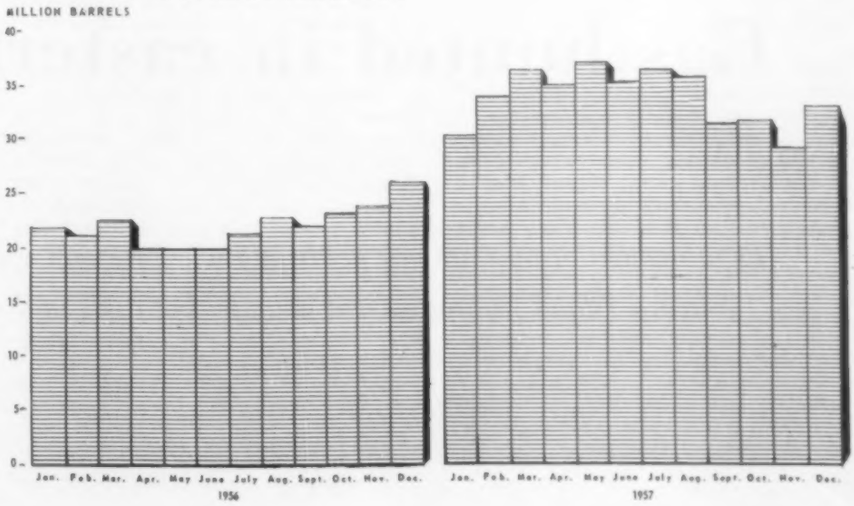
Based on today's world market structure, prairie crude cannot be delivered economically at Montreal. To make the project work, it would be essential to enlist government action to limit imports or subsidize the Alberta oil through import duties, or other artificial means.

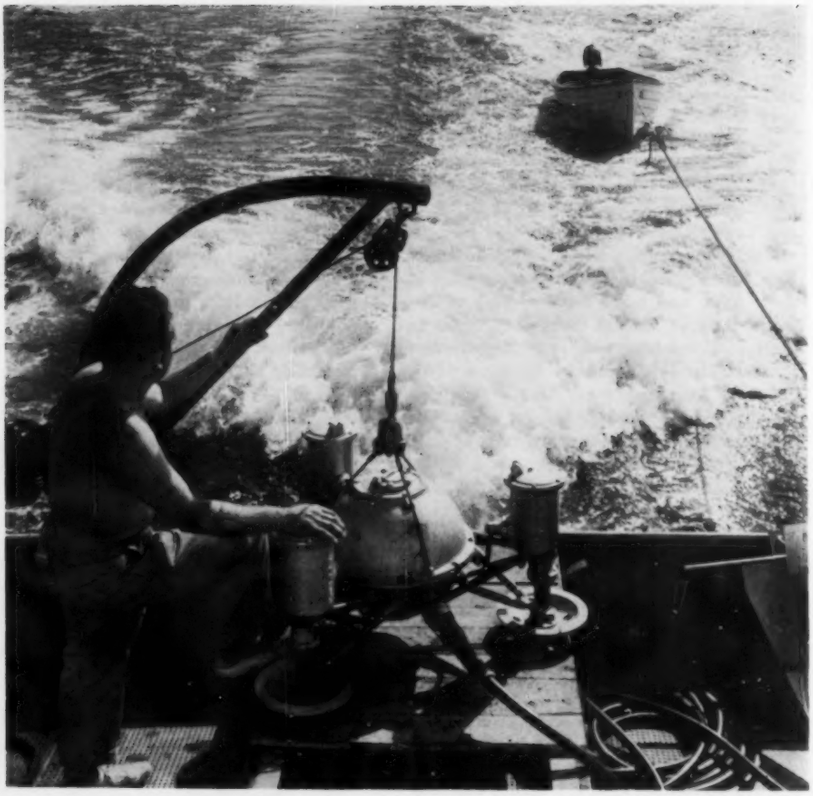
Jupiter Oils Ltd. has taken over control of Edmonton Pipe Line Co. Ltd., and a newly named board plans to increase operations of the pipeline company.

Earl A. Killian, a director of Jupiter, New York, has been named president—succeeding Cody Spencer. Samuel G. Coultis will continue as managing director.

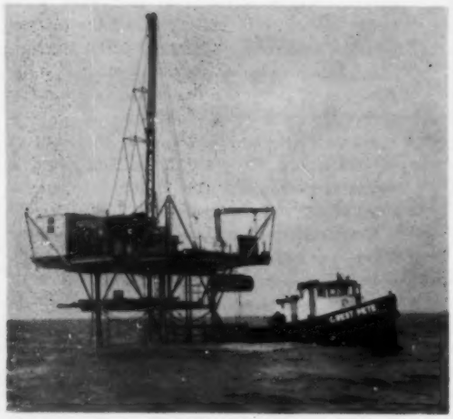
Comprising a 40-mile 6-in. main line and 42 miles of gathering line, the line operated by Edmonton pipeline runs from Camrose, Alberta, to Edmonton. Sourse of crude from the line (15,000 b/d capacity) is the Joarcam field. END

Monthly oil deliveries by Canadian trunk pipelines.





Survey boat belonging to Radar Exploration Co., Toronto, moves from one position to the next, between gravity tests at various points on Lake Erie, Ont. The Toronto firm is carrying out the survey for Imperial Oil which has an Ontario government permit to explore 30,000 acres of the bed of Lake Erie.



Offshore drilling platform of Consolidated West Petroleum Ltd. drilling in Lake Erie. This company has drilled 46 wells in the lake with only one failure to date.

Gas hunted in eastern Canada

Development of offshore gas fields in Lake Erie and a deep test on Prince Edward Island feature current activity. Both gas and oil production rose in 1957.

DRILLING activity in eastern Canada in 1957 was about the same as in the previous year—with 441 wells drilled, compared with 438 in 1956. Success ratio was somewhat lower. Wildcats were 7.5% successful, compared with 10.2% in 1956; and development wells were 67.5% producers, compared with 69.6% in 1956. Crude production rose 5% during the year to 627,000 bbl., and natural gas 11% to 14.4 billion cubic feet.

Drilling in the St. Lawrence lowlands and in the Maritimes continued to be unrewarding. Out of 27 wells drilled, only two gassers were completed; no oil wells. One gas discovery in the lowlands looks like a one-well pool, since two offsets were dry.

Reconnaissance work in the lowlands and the Maritimes was active, and exploratory drilling is continuing this year. Imperial Oil Ltd. has begun a deep test on Prince Edward Island, following two years of exploratory work. Location is near Wellington, in Prince County. Scheduled depth is 8,000 ft. to 9,000 ft. A previous effort to find oil on Prince Edward Island resulted in a 15,000-ft. dry hole, near Charlottetown, nine years ago.

Imperial devoted eight seismic crew-months to its Prince Edward Island study last year, in addition to areal magnetometer and geological studies there and in New Brunswick and Nova Scotia. Imperial took permits on 409,000 acres in New Brunswick and on Prince Edward Island, plus a million-acre farmout in New Brunswick for future exploration.

Most active area in eastern Canada is in Ontario, where permits were taken in 1957 covering 1,120,890 acres offshore in Lake Erie and Lake St. Clair. Almost the entire area from the southern shore of Lake Erie to the international boundary has been taken by a large group of companies. Twenty crew-months of gravity surveys were made offshore last year. Twelve wildcats were drilled offshore, with one gas discovery with an initial open flow of 937 mcf per day. This discovery by Midcon Oil & Gas Co. was at 1,518 ft offshore from Raleigh Township, Kent County, east of the Tilbury field where there has been considerable offshore development work since 1943. A number of unsuccessful tests were drilled offshore from both Kent and Essex counties.

First offshore work in Lake Erie was undertaken in 1943 by Consolidated West Petroleum Ltd. at a location in 35 ft of water, just over a mile offshore from the Tillbury field. A wooden platform was built on piling—with the piling extending 12 ft above water to escape wave action. In a November storm, a number of 3-in. planks secured with 6-in. spikes were knocked off by waves.

Permanent platforms surrounding wellhead equipment are not built in Lake Erie. Wellhead equipment is installed on the lake bottom, and the platforms removed. More recently, a floating drilling barge has been put in service by another company.

Consolidated West drilled its first well with cable tools. When the hole was 700 ft deep, below known water sands, a 7-in. casing string was run with a bottom-hole packer. On the string, a 7-in. Orbit drilling valve was placed and a 3-in. nipple and valve welded at right angles to the casing just below the drilling valve.

This assembly was placed so as to be just above the lake bottom when the string was set. Above the drilling valve, three joints of casing brought the string to the derrick floor. In making up the surface string, the threads between the 7-in. valve and the joint above were not made tight, so as to be able to back off on completion of the well. In later practice, this joint has been flanged.

After drilling gassers from wooden platforms, a portable steel drilling tower was built in 1949, and all subsequent wells have been drilled from similar and improved towers. Essentially, these towers and platforms are steel scaffolds on four legs, secured in place by wire lines attached to steel deadmen driven into the lake bottom.

The tower is built in standard sections 16 ft square and 15 ft high, with 6-in. tubular steel legs, 3-in. diagonal tubular bracing, and light steel *I*-beams for the horizontal members. The legs in the top tower section can be telescoped to adapt the tower to any water depth. Legs of each section fit into and are bolted to the next succeeding section. The bottom section rests on 4-ft-square pads attached to each leg; the tower is leveled by screw jacks in the legs.

When a well location is made, four tubular steel pile points 10-in. in diameter and 12 ft long are driven into the clay lake bottom in a square about 250 ft apart. Attached to the top of each pile are two ¾-in. steel cables. These cables are tied to floating buoys, pending the arrival of the tower.

The tower is erected onshore, brought out on a barge, and set on its feet by a crane in the center of the square; the eight cables are attached to the corners of the tower as guy wires, and are tightened with large turnbuckles. The drilling platform, 32 ft square, is then placed on top. The platform has an upper and lower level. The upper contains a drilling rig of the spudder type, a bunk house for five men, propane cooking stove, refrigeration, hot and cold water, and radio telephone; the lower is principally used as a casing rack.

All well locations are made by triangulation, using a base line onshore; the angles are turned; and telescopes and two-way radio are used to guide a work boat to the spot where a buoy is placed.

Last year when placing a tower on location, 4½ miles from shore in 70 ft of water, a soft bottom was found where the foot pads sank unevenly. To overcome this, a heavy structural-steel triangle with 44-ft sides and 6-ft-square pads on the angles was built. The tower was set on this triangle, and no further trouble was experienced in leveling. It was another story, however, to relieve the suction and remove the triangle. This problem has not been entirely overcome, although experiments with water under high pressure give some promise.

Thus far, Consolidated West was drilled 46 wells over an area of some 10 square miles. Of the 46 wells, 45 are gas wells; and one well, which was a 2½-mile stepout, encountered tight formation with a little gas, and was abandoned as a dry hole.

Drilling in both eastern and western ends of Lake Erie will be active this year because of permit obligations. In the east, interest is centered offshore from Norfolk, Haldimand, and Welland Counties, where shallow gas has been produced from onshore fields for more than 60 years. New wells drilled in the old onshore fields come in with an average initial production of about 79,000 cu ft per day, compared with an average initial of about 1.7 mmcf per day in the west Ontario fields of Kent and Lambton Counties. Offshore wells from the Tilbury field have an average open-flow capacity of 500 mcf per day. Operators have scheduled a number of deep tests in west Ontario this year, as a result of a successful widlcat in Kent County which found the Ordovician productive.

First portable floating drilling barge to go into service on Lake Erie was built and put in service by Long Point Gas and Oil Ltd., which has several large permits in the eastern part of the lake. The Long Point platform, designed by P. S. Bazett, Long Point vice president and general manager, is a miniature adaptation for relatively shallow work of the general type of barge used offshore in the Gulf of Mexico and elsewhere. First unit is a 60-ft triangular platform with hydraulic legs for drilling in 25 ft of water, with a 10-ft wave clearance. The barge is equipped with living quarters for a crew of six, and can be towed to location by the company's 48-ft work boat and raised into drilling position within two hours. A cable-tool rig is mounted on the platform.

During the current year, Long Point plans to drill a minimum of 10 wells with its portable rig. Other such units are to be built and operated for other permit holders in the lake, as well as on company acreage.

Place value for natural gas in Ontario is about 35 cents per thousand cubic feet—which makes drilling of low-cost shallow wells attractive. Current estimates are that about $2 million will be spent on lake development drilling in 1958.

Acknowledgment: Data on completions in eastern Canada in 1957 are from a paper by J. D. McAlary, of Imperial Oil Ltd.; and B. V. Sanford, of the Geological Survey of Canada—prepared for publication in the June issue of the *Bulletin of the American Association of Petroleum Geologists.*

END

An early service station is attached to a Canadian Oil bulk-storage depot in the '20's.

Part of a network of service stations from the Atlantic to the Rockies is this typical White Rose service station of Canadian Oil Companies Ltd. in Ontario.

Canadian Oil Companies Ltd.

Canadian Oil Companies Ltd.—incorporated in 1908, with roots going back to 1901, when the Petrolia refinery was built—is now a $109 million integrated company wholly owned in Canada.

CANADIAN Oil Companies Ltd.—which was formed in Toronto, Canada, 50 years ago to operate as the subsidiary of an American firm—is today the only fully integrated major oil company owned and operated by Canadians.

Its formation in 1908 came shortly after Canadian Prime Minister Sir Wilfred Laurier made his now frequently quoted prediction: "The 20th century belongs to Canada. . . ."

The prolific growth in the past half-century of Canadian Oil, which now covers every phase of the oil industry from the Atlantic to the Rockies, has proved those words no idle boast.

The forerunner of the present company came into being seven years earlier, in 1901, at the Ontario town of Petrolia, then the center of the small Canadian oil industry.

Its main interest was the manufacture of kerosine, as the automobile was still in the novelty stage—and, indeed, the first North American-built automobile had been sold only three years before.

So it was, in the same year the pioneers Henry Ford and Alexander Winton raced their respective cars in Detroit, that the Canadian Oil Co. of Petrolia was formed.

The company was an amalgamation of a number of producing and marketing companies which had banded together in an effort to survive the intense competition of John D. Rockefeller's Standard Oil Co.

A small refinery, with a capacity of only 1,430 b/d, was built at Petrolia, then an important crude-oil producing area. In November 1901, it went into operation—an operation which was to continue for 51 years.

But the struggle for survival was only beginning. Standard Oil increased its competition in Canada.

One French-Canadian retailer wrote to Prime Minister Laurier of a threat that "Le Trust will sit down on me, eh bien!" Two weeks later he wrote again that the trust had lived up to its promise.

So once again amalgamation became a necessity for a number of the Canadian companies. In 1904, nine companies—including the four largest independent companies then operating in Canada—merged into the Canadian Oil Co. Ltd., with headquarters in Toronto.

Most important was the Petrolia company, as operations were to be centered on its refinery. The new company also controlled a refinery at Marietta, Ohio, and had access to supplies of American crude oil—an important factor, as Canadian crude from the Petrolia area was becoming increasingly scarce and expensive.

As the refinery became more and more dependent on American crude, it was decided to buy a tanker and build a pipeline. The tanker was to ship the crude from Toledo across Lake Erie to Froomfield, in Ontario. From there, it was pumped 16 miles into the refinery at Petrolia.

Late in 1906, the first load of 7,000 bbl of crude arrived. From then on, 1,000 b/d was pumped to the refinery; rest of the crude needed was collected from the wells in the Petrolia area by horse-drawn tank wagons.

Petrolia, important Canadian producing center in the early days: This 1,430 b/d refinery was built in 1901—in the midst of oil derricks.

General view of Sarnia refinery of Canadian Oil: From left to right are catalytic cracker, crude-distillation unit, catalytic reformer, and Udex unit.

celebrates *"Golden Anniversary"*

But, by the following year, the company was in a desperate position, and a slight recession in trade seemed to be the end. It was then that the National Refining Co., of Cleveland, Ohio, began to show an interest in expansion into Canada.

National opened negotiations in 1908 and, just before the end of the year, bought control of the Canadian company for $400,000—leaving just under half the shares in the hands of the original Canadian founders.

And so, on December 4, 1908, Canadian Oil Companies Ltd. was incorporated in Toronto, and National immediately infused new life into the company.

Kerosine was still by far the most important product, as there were still only 3,000 motor vehicles in all kinds in Canada at that time. National had learned a severe lesson in the kerosine price war in the United States; so it had developed a highly successful sales theme. Instead of lowering prices, it increased them and stressed quality. This same policy was adopted with all White Rose products—the brand name of the new Canadian Oil Companies Ltd.

With the help of new ideas and techniques and the arrival of the model T Ford, the company began to prosper. By the end of 1913, there were 50,000 automobiles in Canada, and the sales of Canadian Oil had reached $2,500,000—making a profit of nearly $250,000. By the end of World War I, the number of Canadian automobiles had trebled, and the future of the company was secure.

A few years later, financial newspapers were looking favorably on the company. One major journal reported that the company "has had a most satisfactory record and its future may be regarded with considerable confidence." Canadian Oil continued to expand. Manufacturing had to be stepped up; so the old Petrolia refinery was modernized, and a catalytic cracker installed to keep the company in the octane race. But the company was still a subsidiary of the National Refining Co., and it was not until 1939 that the break was made. National sold its Canadian Oil holdings to Canadian interests, and so control of the company returned to Canada. It provided a necessary shot in the arm. Money and new ideas were poured into the company. A further modernization program was put into effect at the refinery. But many of these plans were interrupted with the outbreak of World War II later that year.

It was not until 1945 that the company's directors, foreseeing the tremendous prosperity which was to come to postwar Canada, were able to put their large-scale expansion plans into effect.

A large lakes tanker was bought from the Canadian government to carry company products to new marine terminals being built at strategic points on the St. Lawrence and Great Lakes.

Hundreds of new service stations were erected, and by 1949 sales were treble those of 10 years earlier. By then it was essential to replace the old Petrolia refinery, and in 1950 the decision was made to build a totally new refinery at Sarnia, Ont., which was to concentrate on the manufacture of

W. Harold Rea, since 1949 president of Canadian Oil Companies Ltd.

New Canadian Oil Building in Toronto, which houses company's head office and that of its southern Ontario division.

Canadian Oil tank wagons at Hamilton, Ont., circa World War I, when most horse-drawn vehicles had almost been replaced.

gasoline, fuel oils, and petrochemicals.

The manufacture of lubricating oils and greases was to be concentrated at another new plant in Montreal which, when it went into production in the following year, had the first homogenizing plant in Canada.

The $35 million successor to the old Petrolia refinery went onstream in 1952, with a capacity then of 20,000 b/d—which has since been increased to 30,000 b/d.

A further $8 million expansion program is now in process to lift the capacity to 50,000 b/d by 1961. A new addition to the refinery last year was Canada's first Udex unit for the production of chemically pure benzol, toluol, and xylol.

The company shares ownership of the 210-mile Sun-Canadian Pipeline which is used to transport products from Sarnia to the major Ontario markets of London, Hamilton, and Toronto. Canadian Oil also has substantial holdings in the Interprovincial Pipe Line Co. and Trans Mountain Oil Pipe Line Co.

But, while the main expansion efforts of the company were directed to manufacturing and marketing, it had also been exploring means of making itself fully integrated by entering the producing end of the industry. The opportunity came in 1955 and, for $23 million, Canadian Oil took over Anglo-Canadian Oil—an exploration and producing company with headquarters at Calgary, in the heart of oil-rich Alberta.

Thus, overnight, Canadian Oil became a leading western producer, with a ready-made producing department and an interest in many wells.

Success was not slow in coming. During 1956—its first full year of fully integrated operation—Canadian Oil completed one of the most successful wildcat drilling operations in the history of the industry.

Altogether, 11 out of 32 exploratory wells became producers. This better than one-in-three average compares with the industry's wildcat success average in Canada of one-in-nine. Of 24 development wells drilled, all but one were successful completed as producers.

By the end of the year, production amounted to 3,300 b/d, and developments during 1956 were estimated to have added 6,000,000 b/d to the total proved reserves.

This was followed up last year by a spectacular success at Innisfail, Alberta, and since hailed as the most important Canadian discovery since 1952. After two unsuccessful attempts, Canadian Oil and its associates struck oil at Innisfail and proved a pay zone of 148 ft, to bring in a totally new oil field. It is estimated that Canadian Oil's share in the Innisfail reserves amounts to about 17 million barrels of crude, 17 billion cubic feet of gas, and a million barrels of liquefied petroleum gases. A report on this field is given elsewhere in this issue.

By the end of 1957, the company had an interest in 209 producing wells, and it is estimated that the company's share of reserves is 33 million barrels.

Also, during 1957, Canadian Oil expanded its marketing of fuel oil in the Niagara peninsula through the purchase of Interlake Fuel Oils Ltd. This large domestic and industrial fuel-oil distributor, with headquarters at Thorold, Ont., also operates marine terminals at St. Catharines and Port Colborne on the Welland Canal which links Lakes Ontario and Erie.

The bunkering station at Port Colborne, together with another at Sarnia on the St. Clair River, will become even more important outlets with the opening of the St. Lawrence Seaway, in which Welland Canal and St. Clair River are vital links.

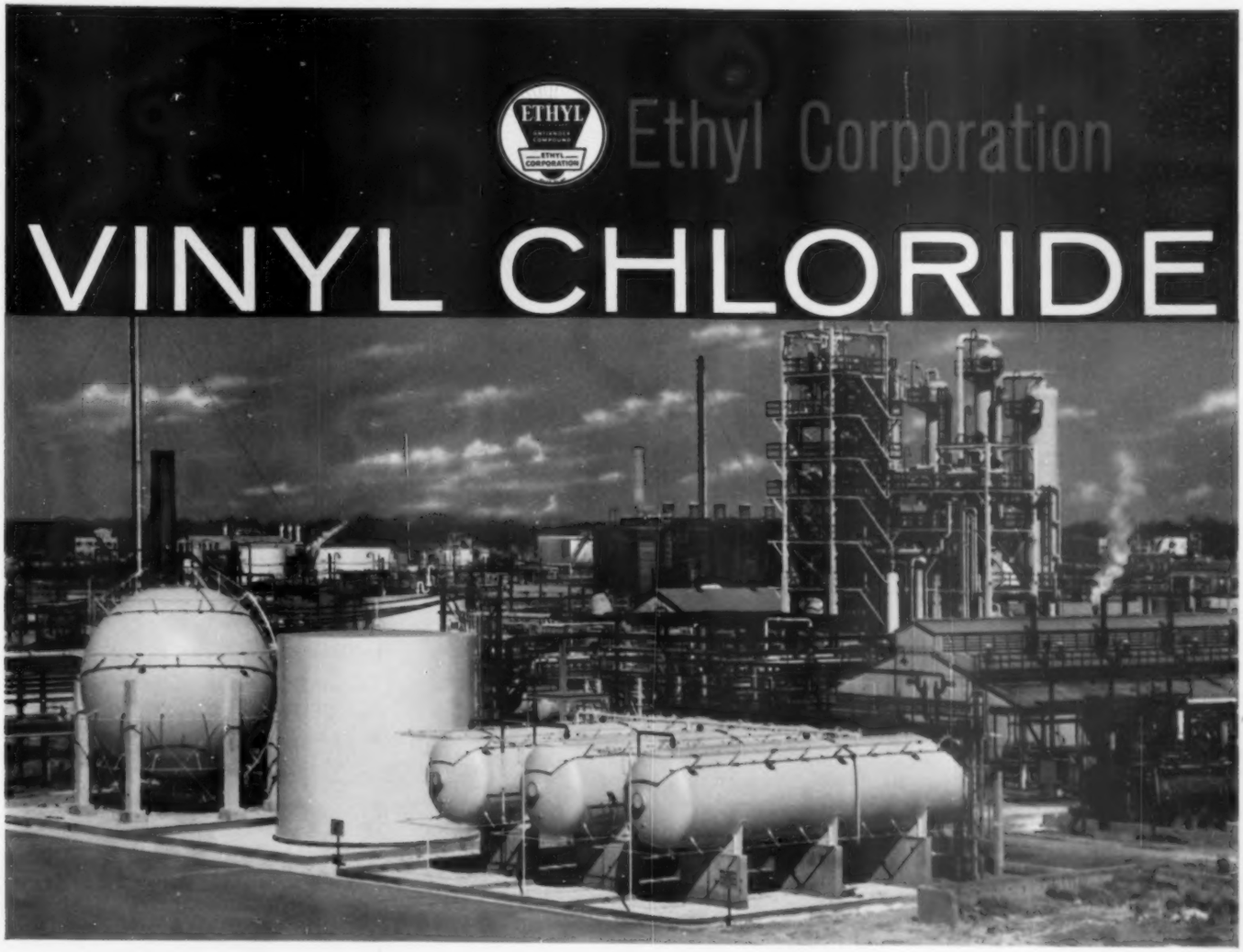
The company's headquarters in Toronto also were moved at the end of 1957 to the new nine-story Canadian Oil Building which houses the head office and the Southern Ontario division of the company. Ultra-modern in every respect, the new headquarters provide the most efficient working conditions for their occupants.

The greatest development of Canadian Oil in its first half-century has come under the guidance of W. Harold Rea, who became president in 1949 following the death of John Irwin. Mr. Rea was only 42 when he took the job, but he had gained wide experience in the oil business. A chartered accountant, born in Kincardine, Ont., he joined Canadian Oil in 1933 as an internal auditor.

From that job, he switched four years later to the sales department, where he engaged in promotion activities. In 1942, he was loaned by the company to the Canadian government to act as liaison officer between the Oil Controller and the armed forces and, subsequently, became executive assistant to the Controller. In this job, he spent considerable time in Washington and worked with the PAW. On his return to the company, in 1945, he was named executive assistant to the president, and a director in 1947.

The nine years since Mr. Rea was appointed president have spanned the greatest expansion period in the company's history. From 1949 to 1957, sales increased to 392 million gallons, from 96 million; net profits rose to $4,010,000, from $931,000; and assets to $109 million, from $22 million.

Now, with Canada's population and industrial potential increasing at an unprecedented rate, Canadian Oil faces even greater challenges and opportunities in the future. END



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General view of process area: Crude still and fluid coker is at the left, and the Houdriflow cat-cracker at the right. Alkylation, reformer, and other process units are in the center.

Canadian Petrofina ups capacity 50%

With a modest capital investment, Canadian Petrofina has achieved a major increase in capacity —utilizing modern techniques in its Pointe-aux-Trembles plant

by H. N. Hewitt

THE design of oil-refinery processing units has become much more precise in recent years. This follows naturally from advances in understanding the principles involved, and has been stimulated by competition among the numerous design and construction companies. The result is that refinery designs now provide for approximately 10% over capacity—just sufficient to meet performance guarantees; and operating experience, in general, bears out the design premise. We can no longer expect a new refinery to increase capacity 50%, or even more, by merely pressing a spare pump into continuous duty, or by the elimination of minor bottlenecks. A customer buying a refinery today receives very nearly what he asks for. He cannot expect substantial built-in surplus capacity, although he may still hope that it will be there. And, to some extent, it is there—it is a question of finding it and using it to the best advantage.

Countering the trend to more exact design are forces working in the opposite direction. Probably the most important of these may be termed "manufacturers standards." Standard sizes and ratings of pumps and compressors, motors and turbines, often dictate the selection of equipment exceeding the general level of 10% over capacity. Economics, or value received per dollar expended, is also a factor. It is sometimes possible to buy more for less money in certain items such as pumps and heat exchangers. New processes, on which limited experience is available, may have a more generous design than processes which have been established for several years.

The net effect of modern design, standards, and construction is that more bottlenecks will be encountered and must be overcome to achieve a worthwhile increase in capacity, and the economic limit in per cent increase has become lower.

The Canadian Petrofina refinery in Pointe-aux-Trembles, a suburb of Montreal, is a modern, complete, and integrated plant. It was designed to process 20,000 b/d of Kuwait crude oil into a full range of products. Processes were selected with an eye to the future. At a time when premium gasoline averaged 93.5 research octane number, the design provided for the even-

Harry N. Hewitt is technical services superintendent at the Canadian Petrofina refinery near Montreal. He was graduated by the University of Alberta in 1940, with a degree in chemical engineering; and during the following war years was employed in ammunition and shell-filling plants as development engineer. After the war, he became inspection engineer at the Shell refinery in Montreal. He transferred to Fina early in 1954, when construction of the refinery began—serving as chief inspector. He has been responsible for technical services since the organization of this department a year ago.

tual production of 100-octane gasoline. Processing units include:

Crude topping and vacuum flashing	20,000 b/d
Fluid coke	3,800 b/d
Ultraformer	3,600 b/d
Houdriflow catalytic cracking	16,000 bbl total feed
Vapor recovery	—
Polymerization	—
Alkylation	1,400 b/d
Hydrodesulfurization	3,000 b/d
Treating	—

The necessary offsite facilities complete the picture.

Operations commenced in the autumn of 1955, and shortly thereafter some of the limitations on overcapacity became apparent. Based on experience gained during the first year, we felt that a 50% increase in crude charge would be practical. Due to our limited staff, consultants were engaged to make a study of the refinery and recommend an expansion program. The study indicated an expansion to 30,000 b/d could be achieved with a reasonable expenditure, but to go beyond this figure would require extensive and major revisions.

The following paragraphs describe the current program, together with a number of items which have already been completed.

Before going into details, a few general remarks may be of value. The projects which constitute the current program have been scheduled over a period of approximately 18 months, from the fourth quarter of 1957 to the second quarter of 1959. In this manner, the costs are distributed sufficiently to avoid a heavy expenditure at any one time.

The major projects and completion schedule are as follows:

Crude unit	July 1958
Ultraformer	August 1958
Utilities, first stage	July 1958
Utilities, second stage	May 1959
Coker vapor recovery	May 1959

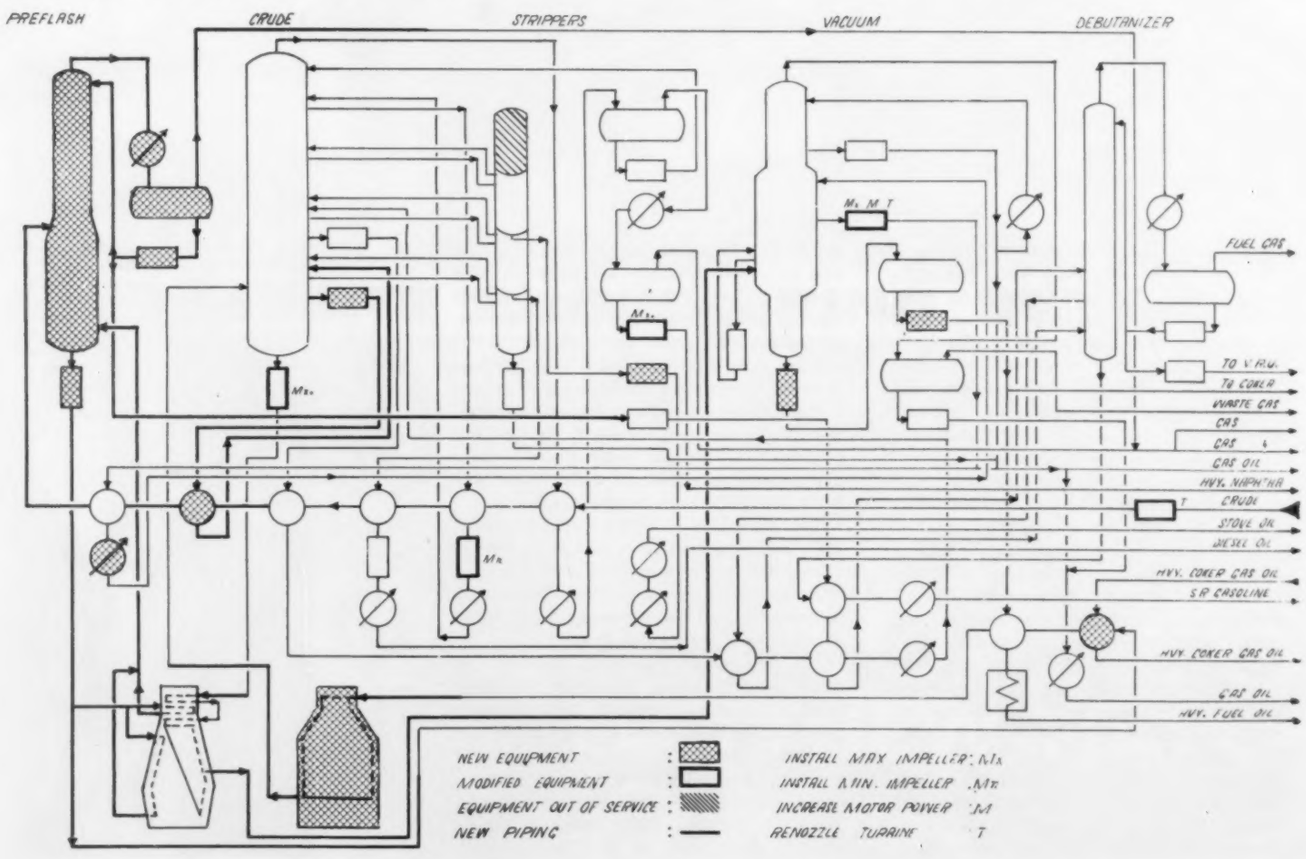
Briefly, in the early stages, most emphasis is placed on the crude unit revamp—followed closely by the Ultraformer. At the same time, a minimum of work will be undertaken on utilities other than steam generation. The program will culminate in May 1959 with the completion of the coker vapor recovery and the remaining work on utilities. A number of smaller projects described later are also fitted into the program.

New equipment is selected on the basis of probable future requirements, operability, and economy. Pumps, for example, are specified with impellers less than maximum size, so that the duty may be increased by simply installing a larger impeller. Heat exchangers are specified with a generous heating surface. Two-pen instruments are specified wherever possible, rather than single-pen instruments. Further examples could be cited, but these should suffice to outline the philosophy.

Crude Topping and Flashing Unit: The logical starting point for an expansion program is the crude topping and vacuum flashing unit. Our experience in processing up to 24,000 b/d of crude oil indicated that the available heat and certain pumps were limiting. The consultants' study confirmed and extended our own findings. Their process design for 30,000 b/d called for the addition of two major equipment items, viz., a preflash tower and a crude-oil heater, together with necessary auxiliaries, and the addition of a number of pumps and heat exchangers in other services. A simplified arrangement is shown in the flow diagram (Fig. 1). New equipment is shaded; modified equipment and new piping are shown in heavy lines.

The new oil heater will permit rearrangement of heating duties with a minimum of changes on the existing combination heater. The present vacuum-feed preheat coil will be used to reboil the preflash bottoms. For this service, the coil will be changed from single-pass to double-pass to reduce pressure drop. The present crude preheat coil will then be changed to vacuum preheat.

Fig. 1 Simplified flow diagram of crude and vacuum revamp.



The new heater will have a rating of 62,000,000 Btu per hour, and will heat the preflash-bottoms stream going to the crude tower.

The preflash column is designed for a net overhead of 11.3% of the crude feed. The tower will be provided with overhead condensers and accumulator, reflux and bottoms pumps, and water drawoff from the top trays. The upper small-diameter section is provided with 18 trays, and the lower section with six. This equipment will reduce the load on the crude column to permit it to fractionate the higher charge of 26,600 b/d of preflashed crude. Since light straight-run will be removed in the preflash tower, the crude tower will yield a heavy-naphtha overhead suitable for reforming. Side-cut streams will include stove oil, and light and heavy gas oils. The existing side drawoff and stripper for heavy naphtha will be taken out of service. For this reason, the upper intermediate reflux duty will be lower, and a minimum size impeller can be installed in the pump. A lower intermediate reflux, complete with pumps and heat exchanger, will be added at the heavy gas-oil drawoff level.

Among other new equipment to be provided are pumps for stove-oil product, vacuum tower bottoms, and coker charge. New Heat exchangers other than those already mentioned are in heavy-coker gas oil—preflashed bottoms, and heavy vacuum gas-oil cooling services. Calculations indicated that the vacuum tower is ample for the new duty. The transfer line from the heater to the tower, however, will be enlarged from 10 in. to 16 in. in diameter, and a new 16-in. nozzle will be installed on the tower. This line, together with the charge line from the new heater to the crude tower, will be major items of expense in the piping changes, as both are alloy. Revisions to pumps are shown in the flow diagram, and include changes in impeller sizes with or without increased power in the drivers, as noted. It will be possible to renozzle the turbine drivers to gain the necessary increments of power.

The refinery has a single large control room with graphic panel. The new crude equipment will be portrayed, and new instruments mounted on an extension of the panel. Thus the theme and harmony of the control room will be maintained.

Ultraformer: Heavy straight-run naphtha production from Kuwait crude is approximately 15% by volume, requiring reforming capacity of 4,500 b/d, which represents an increase of 25% over the original design. The revamp on this unit is considerably less involved than that just described on the crude unit, and is shown in the flow diagram (Fig. 2). The legend is the same as in Fig. 1.

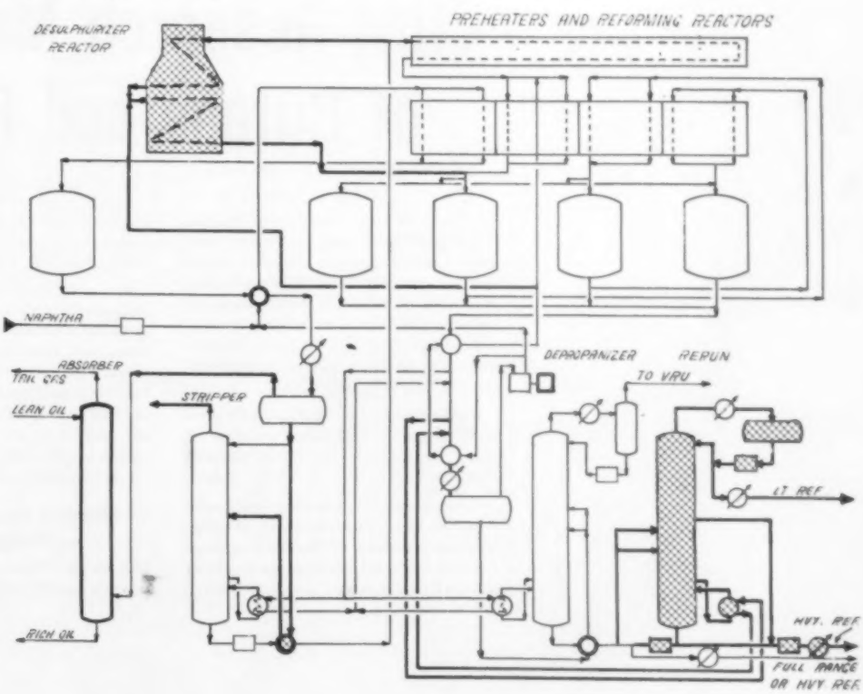
Operations here, too, have revealed a bottleneck in heater capacity—particularly on the reformer-reactor preheat, and to a lesser extent on the desulfurizer preheat. A small new heater of 10,000,000 Btu duty, designed to preheat 30% of the reactor feed, will relieve the first problem. The second will be taken care of by adding two new shells to the existing four desulphurizer-effluent feed exchangers. Following these exchangers and a cooler, the desulfurizer effluent will pass into a new stripper feed drum, where a separation of gas and liquid will be made. At the present time, this total flow is directed to the top of the stripper tower; whereas in the revamp, the gas will pass directly to the absorber, and part of the liquid will follow the present route to the top of the stripper and the remainder will be fed to the mid-section via a new bottoms exchanger. The stripper overhead will be redirected from the absorber to the vapor-recovery unit. Higher-capacity trays will be installed in the absorber to cope with the heavier gas load. A new and larger high-pressure separator drum will be installed to provide more residence time, and the existing drum will be relocated to serve as the new stripper-feed surge drum. The recycle-gas compressor duty will be increased to the limit of the motor driver. To provide a reasonable safety margin, the motor will be rewcund, using high-temperature insulation for a 25% gain in power.

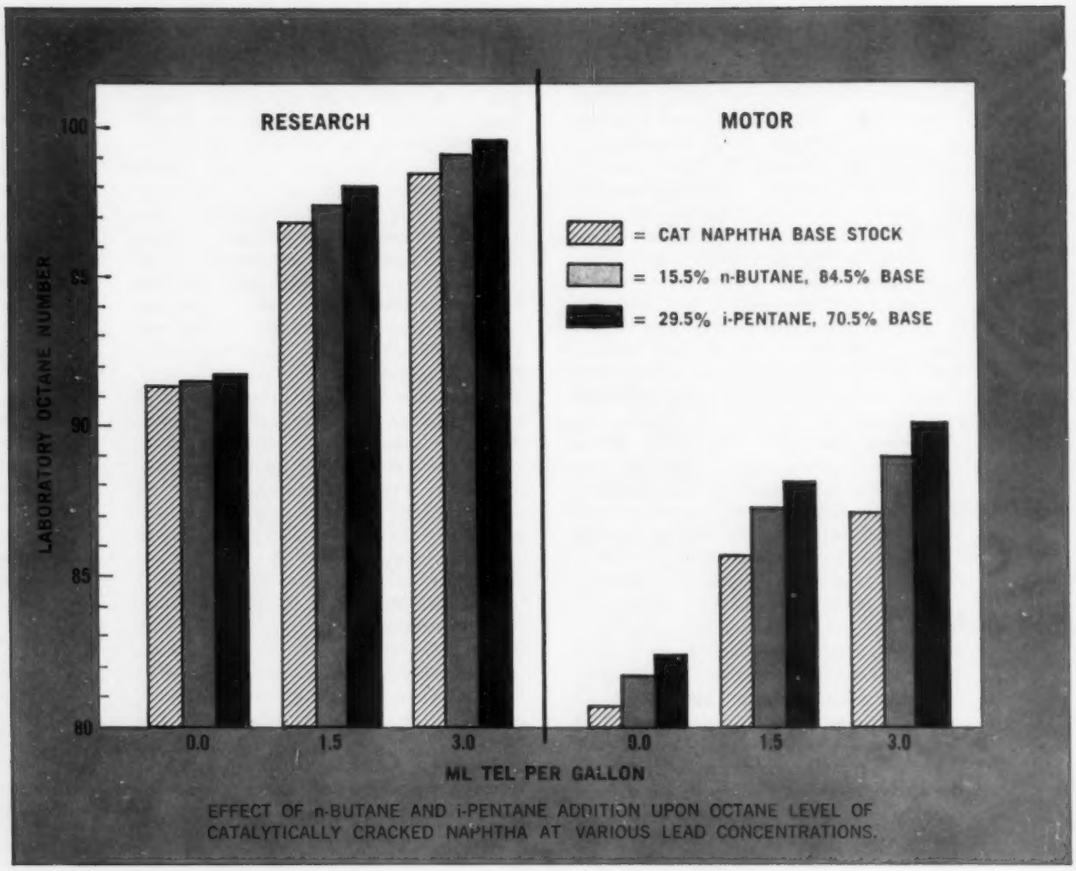
On the product side of the unit, the depropanizer tower will be operated as a debutanizer. More preheat will be provided for this service by adding to the feed bottoms exchanger. A rerun tower, with all the necessary auxiliaries, will be installed. This will yield a light and heavy reformate, and will allow greater flexibility in gasoline blending.

Houdriflow Catalytic Cracking: In an integrated refinery, many streams flow directly from one unit to the next without the benefit of passing through intermediate tankage. The Houdriflow catalytic cracker was designed to receive hot feed from the crude and coker units with a minimum of cold feed from storage. Since it is often necessary to run a quantity of cold feed, it follows that one of the first bottlenecks encountered was the feed preheater. The need for more preheat was urgent and, therefore, a new heater of almost double heat duty—50,000,000 Btu per hour—was installed during the summer of last year. This one additional piece of equipment has made it possible to increase the feed rate to 140% of design while charging a high proportion of cold feed. Unfortunately, sufficient feed has not been available for long enough periods to push the throughput higher and investigate bottlenecks in fractionation and other units downstream of the cracker, e.g., vapor recovery, polymerization, and alkylation. It appears, however, that the Houdriflow unit will handle the 50% increase in feed, with the possibility that higher-capacity trays may be required in the lower section of the fractionator.

Vapor Recovery: The vapor-recovery unit receives gas and liquid streams from the Houdriflow unit and gas streams only from all other units. The major contributors of gas are the Houdriflow unit and the fluid coker. Tests on this unit have shown that it is not economical to increase the capacity of the gas-recovery equipment—there are too many bottlenecks. It is intended, therefore, to concentrate on efficient operation until such time as complementary facilities are available at the fluid coker. Under present conditions, the cracker and coker must

Fig. 2 Ultraformer revamp.





EFFECT OF n-BUTANE AND i-PENTANE ADDITION UPON OCTANE LEVEL OF CATALYTICALLY CRACKED NAPHTHA AT VARIOUS LEAD CONCENTRATIONS.

Ethyl Research Makes Precise Study of Butane and Pentane Blending

At TODAY's high-octane levels, the use of gasoline blending components in the most economic manner has taken on an ever-increasing importance to the refiner. One phase of refinery blending which has commanded continuous interest is the addition of light hydrocarbon agents to gasoline stocks for vapor pressure adjustment to yield finished motor fuels.

The best economic use of available pressurizing agents is determined to a great extent by their volatility and octane blending characteristics in various refinery stocks.

Thus, in order to establish best conditions for the pressurization of gasoline, accurate knowledge of the blending characteristics of those components employed as volatility correctors is required. Ethyl Corporation's refinery technologists can assist you in determining the most economical use of your pressurizing stocks.

For example, in a recent program, a refiner wanted to know the blending octane qualities of normal butane and isopentane when used individually as vapor pressure correctors in three base stocks—alkylate, catalytic reformate, and catalytically cracked naphtha. The objective was to find the break-even economic values of these agents as blend stocks through the use of correct blending qualities.

Blending Carried Out Under Refrigeration

Due to the critical nature of butane and pentane concentration, all blending operations were conducted in a refrigerated room (ambient air temperature, 30-35°F.) to minimize loss of agent, particularly that of n-butane. Blending was carried out on a weight basis in order to give the percentages desired.

Operations were designed to obtain representative samples for analysis and to minimize loss of material from closed containers after samples had been taken.

Exact Concentrations of Pressurizing Agents Determined by Vapor Fractionation

An accurate knowledge of the concentration of pressurizing agent in a base stock both before and after blending was needed to calculate reliable blending octane values.

Suitable techniques were developed for the exact determination of butane and pentane percentages by the use of gas chromatographic apparatus available at Ethyl's Detroit Research Laboratories.

Statistical Design Used in Obtaining Engine Ratings

Triple Research and Motor ratings were conducted on each fuel at TEL levels of 0.0, 1.5 and 3.0 ml per gallon. In order to insure completely independent determinations, each rating was conducted on coded samples which were rated in a pre-established sequence. The day-to-day variation in the CFR engine was avoided by rating all the samples on one base stock during one day's operation.

Gas chromatographic apparatus determines exact concentrations of pressurizing agents in base stock.

Engine ratings were made according to a statistical design in order to assure reproducible results. The standard deviation for the overall program was 0.20 octane number for the Research and 0.39 for the Motor method, showing good replication.

Laboratory Results Yield Octane Blending Data

Typical results of this study are shown in the bar chart on the opposite page, wherein the effects of n-butane and i-pentane additions upon octane level are shown for catalytically-cracked naphtha at various lead concentrations. From these results, the Research and Motor octane blending values have been calculated and are compared in the table (below).

At the maximum practical concentrations employed, i-pentane and n-butane possess essentially the same Research octane blending qualities at 0.0 and 1.5 ml TEL per gallon, while n-butane excels at the 3.0 ml TEL level. In every case, however, n-butane exhibits higher Motor octane qualities than does i-pentane.

Thus, while the two agents are about equal with regard to Research octane effectiveness at the percentages employed, n-butane would be preferred for this base stock when the maximum Motor octane effectiveness per quantity of agent added is an important factor.

Armed also with blending octane values derived for alkylate and catalytic reformate, the relative economic value of n-butane versus i-pentane for blending can be ascertained on the basis of octane efficiency for the refinery stocks in question.

The above program was designed primarily to show the effects of n-butane and i-pentane at concentrations approaching the Reid Vapor Pressure limits of the CFR engine. While some indication of the effects at intermediate percentages can be gained, exact blending values for a particular fuel at a given pressurizing agent concentration must be obtained by individual laboratory evaluation.

The data obtained from this type of study also permit the determination of blending Reid Vapor Pressure values for the pressurizing agents in question in various gasoline stocks.

BLENDING OCTANE VALUES OF n-BUTANE AND i-PENTANE IN CATALYTICALLY CRACKED NAPHTHA

Volume % * Agent in Base	Research O.N. @ ml TEL			Motor O.N. @ ml TEL		
	0.0	1.5	3.0	0.0	1.5	3.0
15.5% n-butane	92.1	100.3	102.2	86.8	95.3	98.4
29.5% i-pentane	92.3	100.2	101.5	86.4	93.6	96.7

*Maximum practical concentration.

How Ethyl Research is helping you

This study is another example of the professional services available to the refiner through Ethyl Corporation's Refinery Technology Program.

Continuous Research by Ethyl Engineers has produced significant developments and valuable information on all the phases of refining that affect octane quality.

Results of this work are helpful to refiners and can frequently be applied to your specific refining situation by our Refinery Technology staff.

For further information on Ethyl Research services, just call your Ethyl Representative. He will be glad to arrange an appointment for you.

ETHYL CORPORATION
New York 17, N. Y.

RESEARCH LABORATORIES:
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Control room at the Canadian Petrofina refinery.

be operated for low gas production. The gasoline splitter, however, will be modified for more efficient separation of light and heavy catalytic gasolines.

Polymerization and Alkylation: The polymerization and alkylation units are fed from the same feed treating section. Studies on these units are not yet complete; however, it appears that more polymerization capacity will be necessary. The alkylation unit should be capable of meeting increased duty by installing larger circulating and recycle pumps, as the reactor itself is a "cascade-type" suitable for much higher capacity than our original design rate. There may be a limitation in the fractionating system as loadings increase.

Hydrodesulfurization: The hydrodesulfurization unit embodies the trickle process. This unit was one of the first of this type constructed; design tolerances were, therefore, generous in the reactor system. The feed preheater, however—which is a piece of equipment capable of exact design—is limiting on overcapacity. The feed pumps are also limiting. In spite of these two conditions, the unit has been operated at 80% overdesign. To increase feed rates still more, we plan a hot feed system—taking middle distillate directly from the crude and catalytic cracking units to assist the preheat requirement, and modifications to the feed pumps for higher capacity.

Fluid Coker: Plans for expansion of the fluid coker are still in the process design stage—with completion scheduled for the second quarter of 1959. At the present time, we do not anticipate an increase in throughput but, rather, the provision of a complete vapor-recovery system. Such a system would be interconnected with the existing vapor-recovery unit, and would allow much greater flexibility in operations and shutdown scheduling. It would handle the heavy gas load from the coker, plus smaller loads from the crude and Ultraformer units. The equipment to be provided will include low- and high-stage gas compressors, primary and secondard absorbers, a debutanizer—together with the necessary auxiliaries such as pumps, coolers, etc.

Utilities: Offsite facilities are in the course of expansion, concurrent with the program on the process units. Steam generation, cooling water, electric-power supply and distribution, and instrument air drying will each receive its share of attention.

Steam-generation capacity was the first and most urgent bottleneck to appear after the commencement of operations. During the first winter, it was necessary to operate the two original boilers continuously at loads as high as 120% of rating. A marine-type boiler, which was available on early delivery, was placed in operation late in the winter, and did much to relieve the steam shortage. This boiler—although not designed for the type of service required in a refinery—is operating well, with careful attention to firing technique and to clean-out during shutdown. During the following summer, the fluid coker came onstream, and created another steam shortage for the next winter. Due partly to the Suez Canal closure and the consequent interruption in our normal supply of Middle East crude, it was not essential to operate the coker that winter. However, to insure the adequacy of the steam supply, a 100,000-lb-per-hour boiler, together with additional water-treating facilities, was ordered and placed in operation the first of this year. Steam supply is now considered sufficient to take care of the expanded requirements.

Cooling water at present is critical only in the summer months. To take care of the revamp on the crude and Ultraformer, an additional 6,000 gpm of water will be needed. This can be provided by installing the maximum size impellers in the two cooling-water pumps. The motor and turbine drivers will handle this duty. It is felt that this revision will suffice until the spring of 1959, when the coker-gas recovery will be ready for service. At that time, it is intended to add two cells to the present four-cell cooling tower and another circulating pump. If cooling-tower capacity is not sufficient this summer, cold-water makeup from the river can be increased.

Electric power is purchased from the local utility company. The supply is adequate, and reliability is good. The incoming 12,000-volt service on two feeder lines is distributed around the refinery at 4,160, 550, 220, and 110 volts. The system is being expanded in two stages. The first stage—to be completed in June of this year—comprises the installation of forced-air cooling on the two main 12,000-4,160-volt transformers and adding a load of approximately 1,000 hp to existing circuits. A new 750-kva transformer will replace the 600-kva equipment in the substation supplying the crude and Ultraformer units. The second phase—due for completion in June 1959, and providing for the coker-gas recovery system and extension of the cooling tower—will add a further 1,500 hp. This will be supplied at the cooling tower by the installation of the 600-kva transformer from the abovementioned substation to replace the existing 450-kva equipment. The latter will then be used at a new substation to supply the coker-gas recovery.

The instrument air driers are currently taxed to their limit. This service is considered important enough to duplicate the equipment and insure thorough drying at all times, especially in winter.

Tankage: At the increased crude throughput, an additional 500,000 bbl of product storage capacity will be required. Of this total, about half will be constructed this year, and the remainder can be made available on rental basis—which reduces the immediate capital investment.

Organization: A few brief notes will describe the organization phase and the role of our own staff in the expansion program. Process design and engineering for minor projects, such as the new feed heater for the Houdry catalytic cracker, or the new boiler, are carried out by staff. Major projects such as the crude and Ultraformer revamps and the coker-gas recovery are handled by consultants in the process design stage. The functioning of our organization will be described for the crude revamp, as this is typical of our method of operation at the present time.

The process design is prepared in accordance with our wishes and requirements. When complete, it is carefully reviewed by our operating department heads and process engineers, who make any revisions they feel advisable. The revised flow sheets and design data are then passed on to operating personnel, and to instrument and design engineers, for further study and comments. The design and flow sheets at this point are essentially finalized. The careful study and checking in the early stages is intended to eliminate changes and confusion later on as the draughting, fabrication, and construction proceeds. Preparation of engineering drawings is the next step, and is accomplished by our own staff reinforced by extra personnel brought in on a temporary basis. Purchasing and expiditing are handled by members of the purchasing department assigned exclusively to the project. Inspection is provided by our own inspectors, as required. Field fabrication and erection have been placed in charge of a reputable contractor. Throughout the project, there is close cooperation among all departments concerned—particularly between the design engineers and the process engineer assigned to the expansion.

Field construction must be carried as close to completion as possible with the process units in operation. A minimum of work will then be required on scheduled shutdowns to connect the new facilities.

Cost estimates of the expansion program for years 1956 through 1959 are:

1956	$ 80,000
1957	690,000
1958	1,760,000
1959	905,000

In summary, this account of our expansion program has attempted to give a review of the limitations we have encountered and the steps we are taking to overcome them in our progress toward higher refining capacity. It may be of some significance that the major limitation in our process units has been heater capacity. END

"It is increasingly apparent that the domestic producers' responsibility to the United States goes beyond the hard, constant work needed to find and develop the supplies which our people need. In addition to making sure that there is enough of our products to meet demand, producers also have the growing obligation to hold costs down so that the prices to consumers can be kept at the lowest practical level."

—M. J. Rathbone, President, Standard Oil Company (New Jersey)

Esso

STANDARD OIL COMPANY (NEW JERSEY)
AND AFFILIATED COMPANIES

Load-building campaigns boost Ontario-Quebec gas sales

ANTICIPATING the arrival of western gas in another year, distributors in the Ontario-Quebec region are engaged in a load-building campaign which is achieving substantial results. Activity is centered in the metropolitan areas of Toronto and Montreal, two of the dominion's greatest concentrations of population and industrial activity.

As a necessary preliminary to the selling campaign, Union Gas Co. has built a 26-in. line across Ontario, and has extended its mains to many new communities. Temporary supplies are being bought from USA sources to supplement Ontario field production. A 20-in. line has been built by Trans-Canada from Toronto to Montreal, and Quebec Natural Gas Corp. now is converting its customers' appliances from manufactured gas to natural gas. The company has laid a 16- to 20-in. central main across Montreal island from which to serve the area. The company is borrowing natural gas at present from Union Gas, and will replace this when Trans-Canada's line segment from Fort Williams to Toronto is completed.

Quebec Natural now has 250,000 gas customers in the 1,600,000 population area of Montreal. Most current customers use gas largely for cooking, and consumption of gas on a 1,000 Btu basis is about 15 million cubic feet per day. Following conversion of appliances of present customers, Quebec Natural plans a $30 million expansion program to extend its system to new customers. The 5-year program is estimated to bring consumption at the end of the period to more than 100 million cubic feet per day. By 1962, Quebec Natural hopes to sell 40 billion cubic feet per year for industrial uses and 12 billion for home consumption—of which 8 billion would be for home heating. It is planned to heat 100,000 homes with gas, compared with 2,400 so heated at present.

In the Toronto metropolitan area. Consumers Gas Co. is engaged in a whirlwind selling campaign which has increased its gas sales 315% since 1954, when it first converted to natural gas, and 66% in the fiscal year ended September 30, 1957. Sales for the year totaled 14.9 billion cubic feet, compared with 8.9 billion the previous year.

In the 1957 fiscal year, Consumers sold gas to 10,550 new customers previously served by other fuels and added 2,650 customers by purchase of other systems. At present, four out of five new homes in Consumers' territory are being equiped to heat with gas. Gas-heated homes have grown to 45,333, from 4,400, in three years. Dealers are being encouraged to sell appliances, but the company is backing up their efforts with cooking schools, displays and demonstrations of equipment, and intensive advertising.

Consumers has been reducing its rates as business has improved. Four rate cuts in the past three years have brought rates down to $1.91 per mcf, from an average $3.39 per mcf, for residential use. Commercial rates now are down to $1.03, from $2.48. The response to rate cuts and advertising has caused the company to increase its purchase contracts. Gas now is purchased from the United States, but Trans-Canada will take over in another year. Line deliveries will be supplemented in peak periods by storage leased from Union Gas Co., a producer and distributor in Ontario.

Union Gas Co. is an old-timer in the business, having sold gas continuously since 1897. In that year, it had 236 miles of mains serving 22,951 meters. Population of the area served was 190,000, and gas sales 300 million cubic feet. Last year, the company operated 2,642 miles of mains, and sold 14.9 billion cubic feet of gas to 192,300 customers. Population of the area served was 1,753.000.

The company is currently engaged in the largest single expansion program in its history—a program which is making natural gas available to many additional thousands of homes, businesses, and industries throughout southwestern Ontario.

As part of the overall program, a 142-mile 26-in. line has been built from Union's underground storage and transmission center in southern Lambton County, through to a point about 10 miles north of Oakville, where it ties into the Trans-Canada pipeline system. This line is being operated by Ontario Natural Gas Storage and Pipeline Ltd., a wholly owned subsidiary of Union Gas, and will ultimately be the means of making western Canada gas available throughout the highly industrialized area of southwestern Ontario, once the Trans-Canada line has been completed to Toronto.

The program to date has also seen considerable construction of distribution plants in such communities as Strathroy, Stratford, Guelph, and Waterloo, and the building of branch lines from the main line to these places, as well as to Hamilton. Further additions to the distribution systems in all of these communities will be made during 1958.

Presently, peak-load gas is being supplied by Ontario Natural to United Gas and Fuel Co. of Hamilton Ltd., and to United Suburban Gas Co. Ltd., both of which are controlled by Union Gas. When western Canada gas becomes available at Toronto, all of the gas requirements of these two companies will be provided from the Ontario Natural pipeline. Communities served by these two companies include Hamilton, Dundas, Burlington, Oakville, Milton, Georgetown, and Acton, plus substantial rural areas.

Complete plans for 1958 have not as yet been settled, but it is expected additional expansion will include branch lines to such places as St. Marys, Goderich, Amherstburg, and Fergus, and distribution systems

Shell Oil's Waterton No. 2 wildcat well: The new gas structure is approximately parallel to the Pincher Creek gas field, located about 10 miles to the east, and may prove to be larger. The Shell wells are on an exploration reservation covering 201,-253 acres.

for these communities and such intervening points as Seaforth, Clinton, Mitchell, La Salle, Elora, and Elmira. A number of other places may be included. Considerable expansion of the company's previously established markets is also scheduled, and the company expects to begin supplying gas to the city of Kitchener, on a wholesale basis, in the near future.

This year will see the acquisition, by Union Gas, of the natural-gas production, transmission, and distribution facilities of the Dominion Natural Gas Co., with the exception of that company's holdings in Lincoln and Welland Counties and its oil-gas facilities at Port Stanley. Transfer will immediately add approximately 43,000 meters to the Union Gas system. With the assurance of an ample supply of natural gas, it is expected that—immediately on acquisition of these properties—a substantial expansion program will be initiated.

Union Gas has been enabled to undertake this much-needed large-scale program at this time as a result of obtaining an additional supply of natural gas from Panhandle Eastern Pipe Line Co., in the United States, with the approval of the Federal Power Commission. Under this contract, two-thirds of the gas supplied each year is delivered during the period from April to October. The balance is delivered during the winter months, with Panhandle having the privilege of interrupting deliveries entirely during peak periods. (This arrangement is possible because Union Gas, through its subsidiary Ontario Natural, operates a substantial underground storage system.) Furthermore, this particular contract contains a provision for cancellation one year after gas from the Trans-Canada pipeline becomes available to Union Gas.

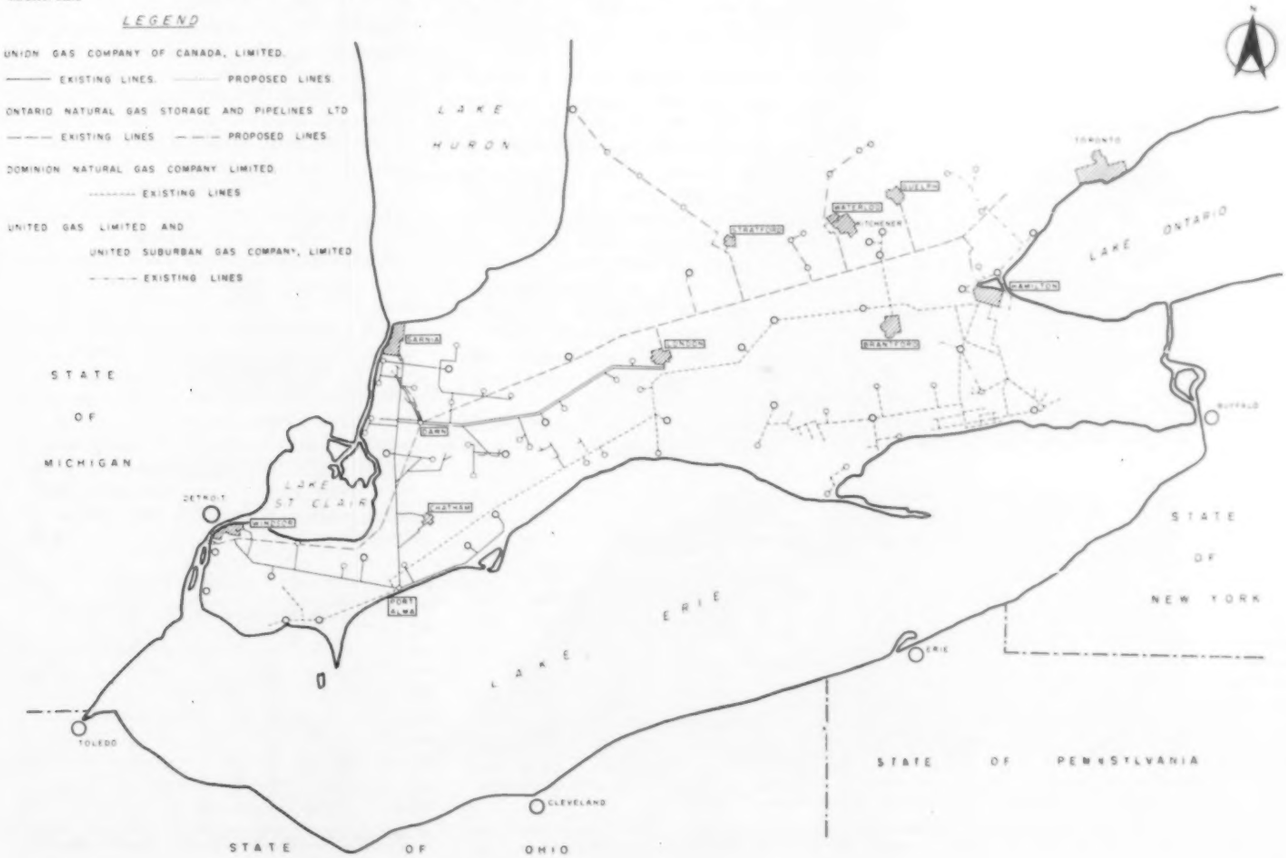
Union Gas currently has an amended agreement with Trans-Canada calling for delivery of large volumes of natural gas each year for 20 years, from date of first delivery. Under the contract terms, Trans-Canada must be prepared to supply 12.5 billion cubic feet of gas in the first year—with the annual maximum increasing each year until, in the 13th and remaining years of the contract, the annual maximum will be 64 billion cubic feet. Union Gas is not, however, obliged to take delivery of more than 75% of the stipulated maximum in any one year. This flexibility permits Union to continue to purchase natural gas which may be produced in southwestern Ontario.

Ontario Natural Gas Storage and Pipelines Ltd. was incorporated in August 1953, and became operative in December 1957 upon completion of the 142-mile pipeline referred to above. This subsidiary now handles gas imported from the United States under already existing contracts, and will purchase the gas from Trans-Canada. Ontario Natural will store and transmit such gas for sale and delivery to retail distribution companies or other agencies, including Union Gas. Ontario Natural will provide gas-storage service, under contract, for at least one other distributor.

Indirectly, Trans-Canada Pipe Lines Ltd. will also benefit from the underground storage operated by Ontario Natural, since this storage will permit Ontario Natural to accept approximately two-thirds of its annual purchases of Trans-Canada gas during the summer months and to accept the balance in the winter period, with provision for complete interruption of deliveries in peak periods.

Current production of Ontario gas is less than 15 billion cubic feet per year—about the same volume sold last year by Union Gas. Trans-Canada thus will be called on to deliver the 40 billion cubic feet required by Montreal, a larger volume than that to Toronto, plus the requirements of Ottawa and the rapidly expanding smaller communities of southern Ontario. Distributors new are talking about expanding their contract requirements beginning in 1963. Since trans-Canada is able to deliver no more than 600 million cubic feet per day east of Winnipeg, it is anticipated that line-looping projects on the transcontinental line will become necessary very soon. END

Map of southern Ontario, showing network of gas lines now operating and proposed. Union Gas Co. will storage large quantities of western gas during summer months in Ontario fields for peak winter requirements of its customers and those of other distributors in Toronto and Montreal.



Geophysical activity in western Canada—down in 1957

New vehicles have solved some of the access problems in western Canada. Shown here is a Nodwell scout truck negotiating difficult muskeg terrain in northern Alberta.

Geophysical activity continued its downward trend in 1957—dropping 10% below 1956. All the provinces suffered a decline in activity—except British Columbia, which gained slightly. Seismic work declined 7%, compared with 56% decline in gravity work.

A SIX-YEAR downward trend in geophysical activity in western Canada continued in 1957—with a decline of approximately 9.8% from 1956 levels. Total crew-months worked were 1,338 during 1957.

Seismic work is by far the more important in total months worked. It declined only 7% during 1957, compared with a decline of 56% in gravity crews. Total seismic crew-months worked were 1,300 during 1957—of which 68% were in Alberta. Alberta suffered the greatest decline in seismic crew-months—dropping from 951 to 884 during the year. Saskatchewan also declined to 260, from 275 in the previous year. Manitoba and the Northwest Territories both declined sharply. The only province which showed an absolute increase was British Columbia—up to 149, from 136 in the previous year.

Gravity work declined sharply during 1957 compared with 1956. The total of 38 crew-months during 1957 was less than half in 1956. The decline was most evident in Saskatchewan, which went down to one-fourth of previous levels.

Because aerial magnetic work cannot be expressed in crew-months, such information has not been included in the accompanying tables. However, in the provinces of western Canada during 1957, a total of 57,374 line-miles of aerial magnetic work was reported—representing a coverage of approximately 57,000 square miles.

The usual seasonal fluctuation occurred in 1957—with April marking the lowest point for the year as the roads closed and the freeze went out of the muskeg. Activity remained low until December—which is about a month later than usual due to the unusually warm beginning of winter last year. As the freeze set in and terrain could be entered, the curve of activity shot up—to reach its peak in March. This is the usual pattern of western Canada's activities, and probably no significant change will occur until some effective and generally applicable method of crossing the muskeg is devised.

END

TABLE II

MONTHLY RECORD OF CREW-MONTHS—WESTERN CANADA, 1957

	Seis.	Grav.	Mag.	Total
January	121	6	—	127
February	137	9		146
March	138	9		147
April	76	4		80
May	95	2		97
June	98	3		101
July	103	2		105
August	105	—		105
September	103	1		104
October	101	1		102
November	102	1		103
December	121	—		121
Total	1,300	38	—	1,338

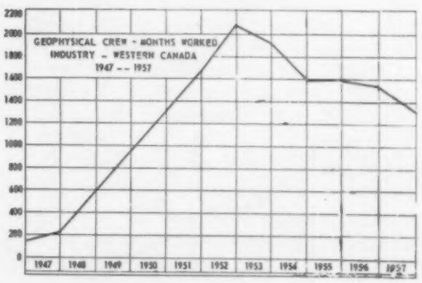
TABLE I

GEOPHYSICAL ACTIVITY BY CREW TYPE—WESTERN CANADA 1957

	SEISMIC			GRAVITY			MAGNETOMETER*			TOTAL		
	1957	1956	1947	1957	1956	1947	1957	1956	1947	1957	1956	1947
Alberta	884	951	155	32	60	41	—	—	—	916	1,011	203
Saskatchewan	260	275	—	6	24	—	—	—	—	266	299	—
Manitoba	3	22	6	—	1	—	—	—	—	3	23	6
British Columbia	149	136	—	—	—	—	—	—	—	149	136	—
N.W. Territories	4	13	—	—	2	—	—	—	—	4	15	—
Total	1,300	1,397	161	38	87	41	—	—	—	1,338	1,484	209

Source: Crew-months data for this tabulation and Table II were obtained through the courtesy of Homer G. Patrick, chairman, Committee on Geophysical Activity of the Society of Exploration Geophysicists. The chart is reproduced through the courtesy of the editors of *Geophysics* for previous years, with 1957 added.

*Does not include aerial magnetic work, which cannot be expressed in crew-months. In 1957, about 57,374 line-mines of aerial magnetic work was reported in western Canada, representing a coverage of 57,000 square mi es.



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Photos courtesy of Michael Todd's Academy Award winning production, "Around the World in 80 Days"

Natural-gasoline plant planned for Steelman field

25 million-cubic-foot gasoline, LPGas and sulfur plant to reduce flares in southeastern Saskatchewan

CONSERVATION of substantial quantities of flare gas from the enormously productive oil fields of southeastern Saskatchewan will be achieved this year through construction of the second, and by far the largest, natural-gas recovery plant to be constructed in the province. Plans which have been pending for almost two years will become a reality with an initial feed rate of 25 mmcf per day. The plant design provides for ultimate increases to 45 mmcf per day. All the gas will be purchased by Saskatchewan Power Corp. for the southeastern sector of its distribution system.

With capital cost estimated at about $20 million, the conservation plant is to be built in the approximate center of the Steelman oil field by Steelman Gas Ltd., a company owned jointly by Provo Gas Producers Ltd. and Dome Exploration (Western) Ltd. The basic design has been executed by Brown & Root Ltd., of Edmonton and Calgary. A detailed cost analysis was prepared by Pryde-Flavin Engineering Ltd., of Calgary. A gas-production forecast for the Steelman area was published by Alex W. McCoy Associates Inc., of Tulsa. A study of the western market for liquefied petroleum gases and sulfur, constituting the principal byproducts of the gas-recovery process, was made by Hu Harries & Associates, of Edmonton. Studies of gas utilization and possible storage reservoirs in salt cavities for peak-load LPG were prepared by Provo itself.

Production estimates—Steelman oil field—natural gas, January 1957 ("West area")

Year	Oil (barrels per month) Proved	Probable	Total
1957	636.5	42.5	679.0
1958	746.5	369.5	1,116.0
1959	701.5	645.5	1,347.0
1960	616.4	749.6	1,366.0
1961	542.5	799.5	1,342.0
1962	498.8	739.2	1,238.0
1963	422.3	707.7	1,130.0

Projection of natural-gas production, daily average rates:

Year	Proved	Proved and Probable (mmcf per day)
1957	28	28.1
1958	51	57.9
1959	65	84.2
1960	70	109.8
1961	74	128.6
1962	67	138.1
1963	58	137.6
1964	49	127.0
1965	41	112.2
1966	33	90.0
1967	26	74.6
1968	21	60.8
1969	16	49.4
1970	12	39.0
1971	9	30.9

Total cumulative production: Proved 223.5 mmmcf; probable 459.2 mmmcf; total 682.7 mmmcf.

The record of meteoric expansion of crude-oil production in the southeastern sector of Saskatchewan—stimulated by construction of the Westspur pipeline out of the region in the summer of 1956—can be seen in the growth of average throughput from a standing start in July of 1956 to 35,300 b/d at the end of the year, and a fairly steady increase through 1957 and the first month of 1958 to a new peak of 79,035 b/d in January. Further growth is expected during 1958, as the USA import quota is not likely to be oppressive, and there is a widening market for Saskatchewan crude in Ontario. Thus the problem of disposing of associated gas has become acute, and the steps being taken to alleviate it are being implemented with some urgency.

Oil production in southeastern Saskatchewan is taken from the Mississippian limestone formation—the principal members being the Charles and Mission Canyon members of the Upper Madison group. The Mississippian formation rises northeastward on the flank of the Williston Basin, and forms a wedge against the unconformity created by the beds of Jura-Triassic age deposited on the markedly eroded Mississippian surface. Productive areas of the two members overlap to some extent, so that some wells may be dually completed in both formations.

The oil accumulations occur principally in stratigraphic traps. In the east group—comprising the fields from Alida through Cantal, Hastings, and Nottingham to Carnduff—the fields consist of elongated fingers, generally narrow and extending in a direction from southwest to northeast. They are formed by tectonic highs constructed by the capping of the porous limestone by an impermeable erosional surface. The west group—comprising the largest fields of Steelman, Lampman, Kingsford, and Frobisher, which were recently consolidated under the single name of Steelman—is made up of shallow domes with 50 ft to 75 ft of closure capped by Evaporite beds, caused by minor bending of the porous rock. They are featured by sharp changes in lithology and the presence of unproductive locations in the middle of large productive areas—making reserve estimates subject to modifications as fields are developed to their full limits.

Reservoir conditions are quite different in the two areas. The east pools have active water-drives, and a much lower rate of gas-reserve depletion is anticipated for them. Their location at some distance from the west fields, and their indicated much lower peak producibility, preclude them from inclusion in the initial program; but they may become economically capable of inclusion at a future stage of development, depending on product prices and other conditions from time to time.

Estimated proved reserves as of January 1, 1957, for the west area, were 249.3 mmmcf, while proved plus probable reserves were 504.1 mmmcf. At the same date, the east area was calculated to have 139.3 mmmcf of proved reserves and 163.3 mmmcf of proved plus probable reserves. The reserve estimates assumed a high development rate and an increasing oil market sufficient to maintain current average pro-

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duction rates per well, conservatively.

Peak production rate was estimated at 74 mmcf per day in 1961 from 950 wells, on the basis of proved reserves only, or 138 mmcf per day in 1962 from 1,016 wells if probable reserves were included. The conservative nature of the estimates is indicated by the fact that oil production—calculated to reach approximately 25,000 b/d by 1958—had already topped 31,500 b/d by October 1957 and, subject to a technical interruption in November, was estimated to be climbing well beyond this figure by February 1958.

The report of Alex W. McCoy Associates recommended construction of a processing facility designed ultimately to handle about 80% of the estimated peak production of 74 mmcf per day from the west group, or 60 mmcf per day. The west group, the report concluded, has an obviously economic casinghead-gas reserve, proved and available, to the proposed processing plant. The pools in the principal field are depletion-type reservoirs, which will exhibit a high rate of production of the gas associated with the oil and will yield a high percentage of the gas in place in the reservoirs as ultimate recovery. The eastern fields are calculated to have a peak production of not over 30 mmcf per day, and should average 20 mmcf per day over a life of 25 years.

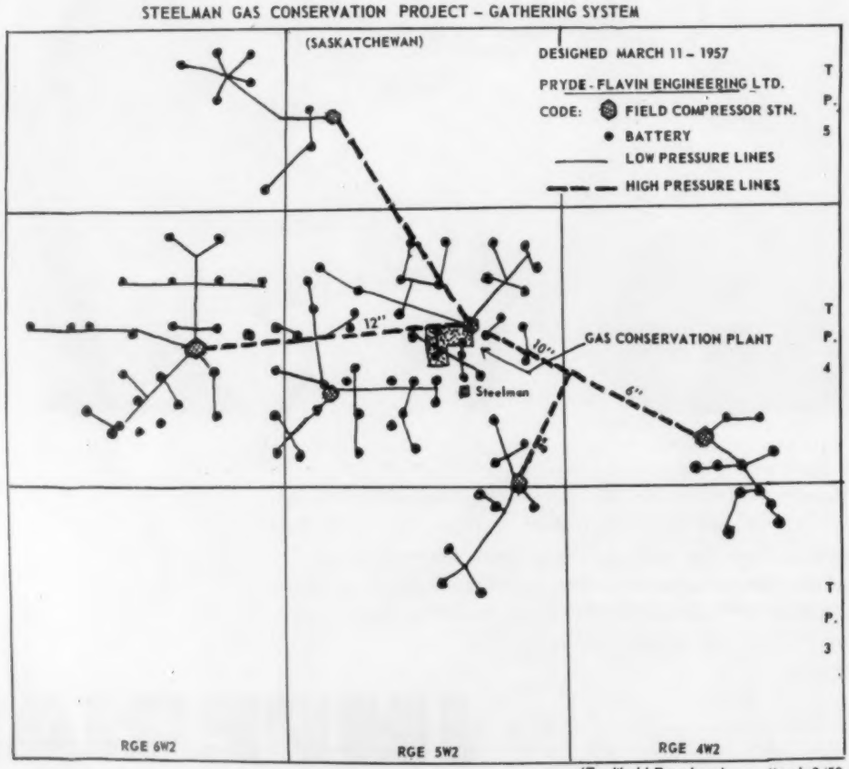
The report found that a casinghead-gas processing plant built in the Steelman area would be justified first as a facility to serve the west area, where the gas reserves of major size and the rate of production of gas with oil pose the important problem of gas conservation and, fortunately, also involve a gas-production rate per unit of area high enough to justify the investment for gathering lines and processing. The gas reserve in the east group, considered as a future possibility for an extended plant, is both lower and spread over a comparatively large area.

There are no free gas caps of substantial size in any of the west-group pools, except for Frobisher—and its gas cap has not been evaluated. The ultimate recovery of gas in place was estimated at 80% overall, subject to minor adjustment in the event of development of a water-drive in the Frobisher pool, which would reduce the gas recovery while increasing oil recovery.

General: The whole gathering system, as engineered initially, consists of approximately 97.5 miles of 3-in. to 14-in. pipelines and compression facilities of 7,000 installed horsepower.

In the initial stage, the lower-than-peak volumes required can be secured economically by either reducing gas volume over the entire area or eliminating gathering from the two least productive pools and prorating required volumes over the remaining area. Annual direct field operating costs were estimated by Pryde-Flavin at $54,000 for full field development. Raw gas is to be gathered from individual batteries at 15 psig, delivered to six field compressor stations and thence transmitted to a central plant which will compress it to 60 psig discharge pressure.

STEELMAN GAS CONSERVATION PROJECT – GATHERING SYSTEM



(For World Petroleum) March 3/58

The processing plant is a conventional absorption-oil type—with desulfurization, absorption, demethanizing, rich-oil stripping, and hydrocarbon fractionation steps. Compressors, absorption oil pumps, and oil exchangers are designed for the initial feed gas rate of 25 mmcf per day—with provision for future feed gas rate of 45 mmcf per day by installation of additional compression, refrigeration of oil and gas streams, and additions to the utility systems. Piping, vessels, towers, controls, and most of the exchangers are designed initially for the ultimate load.

The design provides for summer-time recovery of 75% of the propane, 95% of the butanes, and essentially 100% of the gasoline fractions. The expected yearly average propane recovery will average 81% due to lower seasonal operating temperatures encountered during most of the year.

Sour gas at 60 psig will be compressed to 235 psig, cooled, and desulfurized by contacting in a bubble-tray tower with 15% monoethanolamine-water solution. Sweet gas is then compressed to 830 psig, cooled to 80 F (at which the majority of the gasoline fractions are condensed), and the remaining gas fed to the absorber tower. The lean oil absorbs the desired propane and heavier components, and passes on to a rich-oil flash tank—where part of the light ends, viz., methane, ethane, and propane, are preferentially flashed. The flash gas is returned to the second-stage compressor suction and recompressed with the rich feed gas. The absorber overhead gas is then dehydrated in a dry-bed type of unit before metering to sales.

The rich oil from the flash tank is heat-exchanged and then demethanized in a conventional reboiler absorber. Heat for the reboiler is supplied by hot lean oil returning from the still. The demethanized rich oil is further heat-exchanged with hot lean oil, preheated in a gas-fired heater, and steam-stripped in the still. The overhead product from the still is partly condensed and returned as reflux, while the remainder passes through the product condenser and raw-make condenser to the surge tank, which is sized to hold several hours' raw-gasoline production to buffer the effect of plant feed-gas fluctuation on the fractionator flows. The fractionation flow is conventional cascade, de-ethanization, and debutanization. The gasoline product, after cooling to 100 F, is contacted in Perco treaters to convert mercaptans to disulfides. The products flow to separate tanks of four days' storage capacity, and can then be loaded out by rail or truck.

Economics of Operation: Projected product sales fall into five categories—of which the residue gas is the largest in volume and the most important for steady returns. It is priced initially at 14½¢ per mfc—with escalation at the rate of ¼¢ per mcf per year, delivered to the nearest Trans-Canada or Saskatchewan Power Corp. compressor station at 575 psia. The plant-gate price is calculated from a base of 10¢ per mcf—

(*Continued on page 132*)

BP MAPS THE FUTURE

Children of Medina, the new township near Kwinana Refinery, outside their splendid modern school.

A new township springs up in Australia

SEVENTEEN MILES south of Fremantle, the main port of Western Australia, is Australia's biggest refinery – Kwinana – owned and operated by one of the British Petroleum group of companies.

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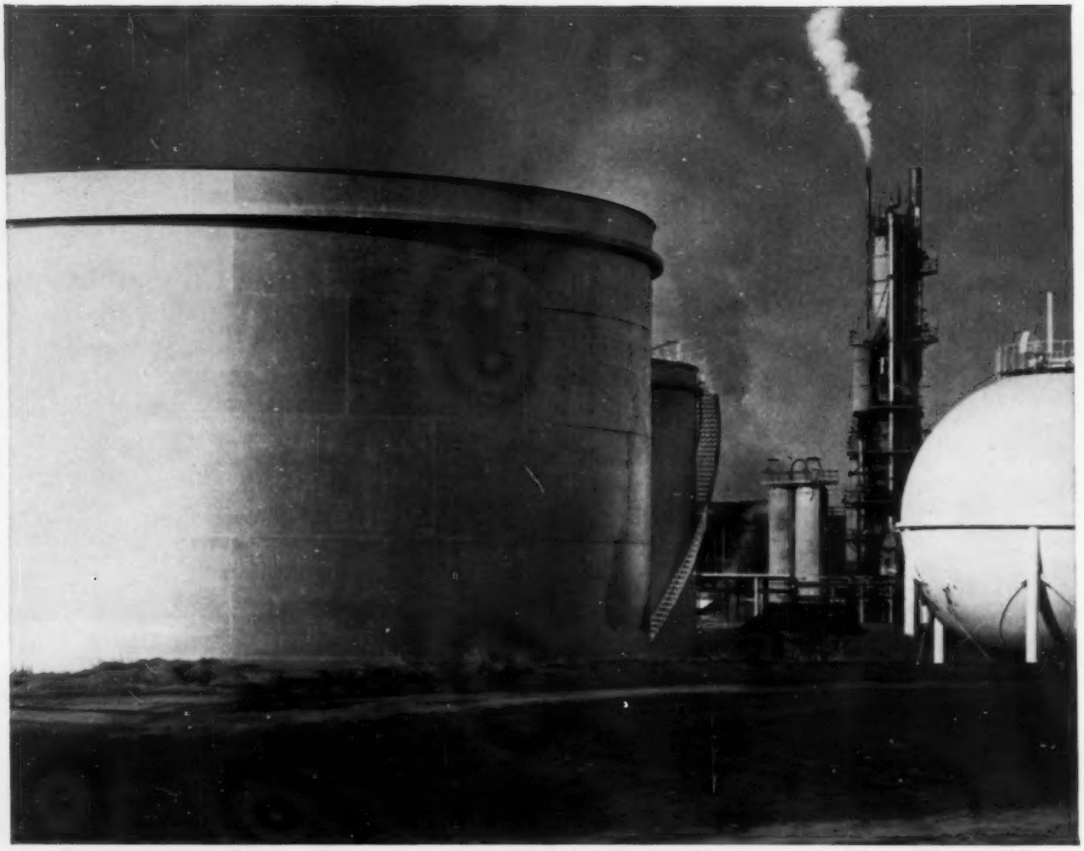

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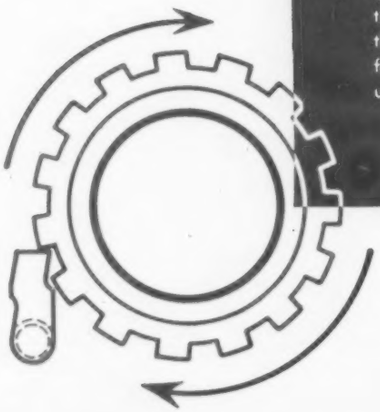

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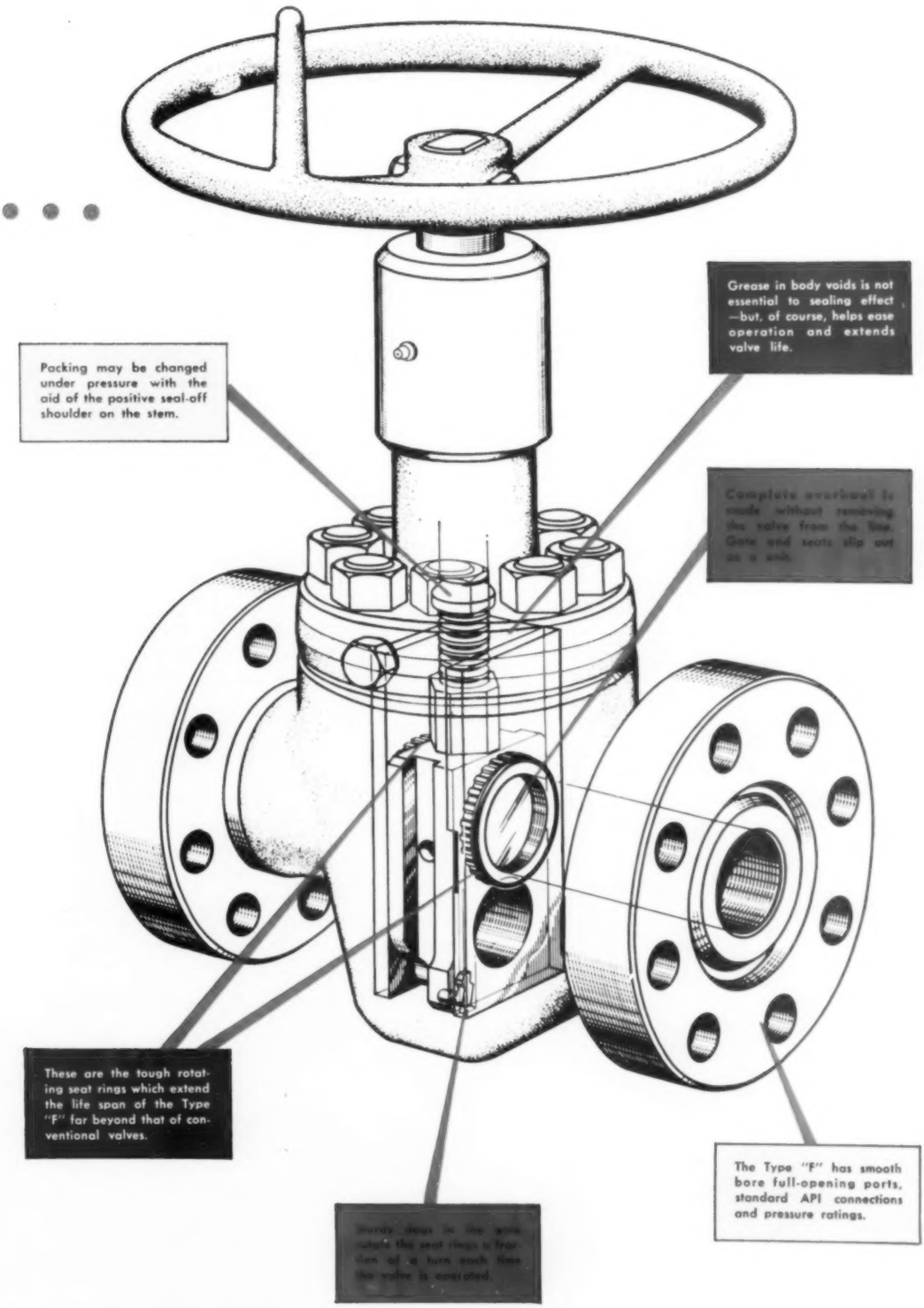
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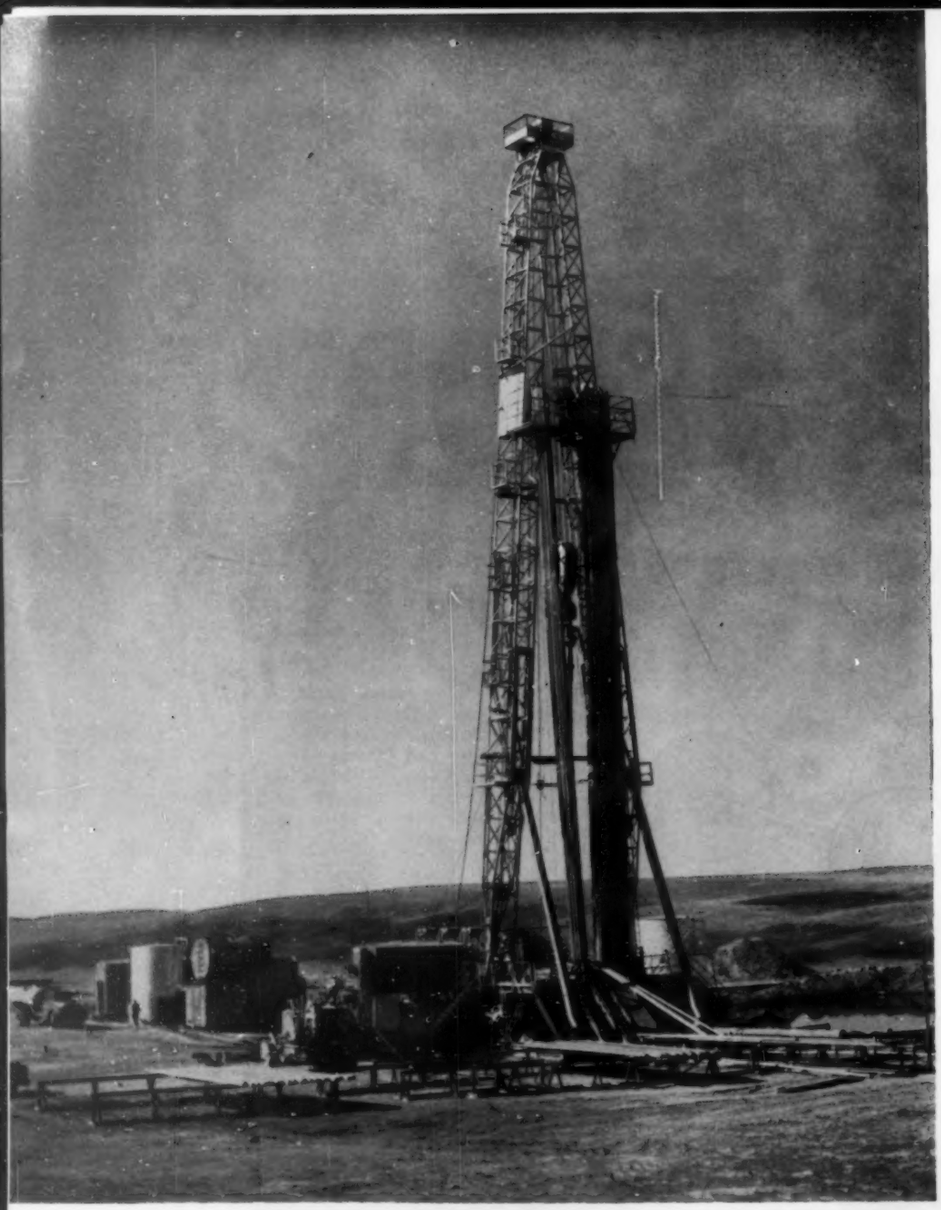

Imperial Oil's deep test, Hummingbird No. 6-13, drilling as of October 1957 in Saskatchewan.

Saskatchewan oil activity high in 1957

by G. H. Nielsen*

In 1957, the oil industry in Saskatchewan continued an excellent rate of growth. Exploration held up well during the year. Previous production records were broken at every turn, as each month of 1957 surpassed its counterpart of 1956. Pipelines had a high rate of investment in expansion and construction. Gas conservation was active in the west-central and southeast areas of the province.

Exploration Activity Slower in 1957: Saskatchewan was still a dominant factor in western provinces exploration activity. The first quarter of 1957 saw an average of about 15 crew-month active, while during the rest of the year crew-months averaged 25 to 30; crew-months for the year totaled approximately 280. Activity was slightly heavier in the southeast, north-central, and northwest sectors of the province. Currently, operations are very slow, but it is hoped 1958 generally will follow the pattern experienced during the past three years in the province.

By mid-year 1957, Saskatchewan appeared headed for a really outstanding year of wildcat drilling, as the figures showed a total of 123 wells—representing a 35% increase over the record 91 the year before. However, the third and fourth quarters added only 147 wells to this total, compared with 171 during the same 1956 period. The result was that total activity was 270 wells in 1957—up only 8 wells over the previous year.

Wildcat discovery ratios also were down in 1957, as they were for all the prairie provinces. Saskatchewan recorded 28 new oil wells, and one new gasser—for a ratio of one in nine. This represents a considerable drop from 1956, when Saskatchewan operators had the phenomenal success ratio of one in four. As in the previous year, no new oil fields were discovered.

Land activity continued at a high level. The latter part of the year saw a start on the releasing of free-

(Continued on page 156)

* *G. H. Nielsen, born in northeastern Saskatchewan, attended the Royal Roads Military College, Victoria, B.C., and the University of Saskatchewan, Saskatoon, Sask. The latter graduated him with the degree of bachelor of commerce in business administration. Since graduation, he has been with Canadian Petroleum Assn. as administrative assistant to the manager.*

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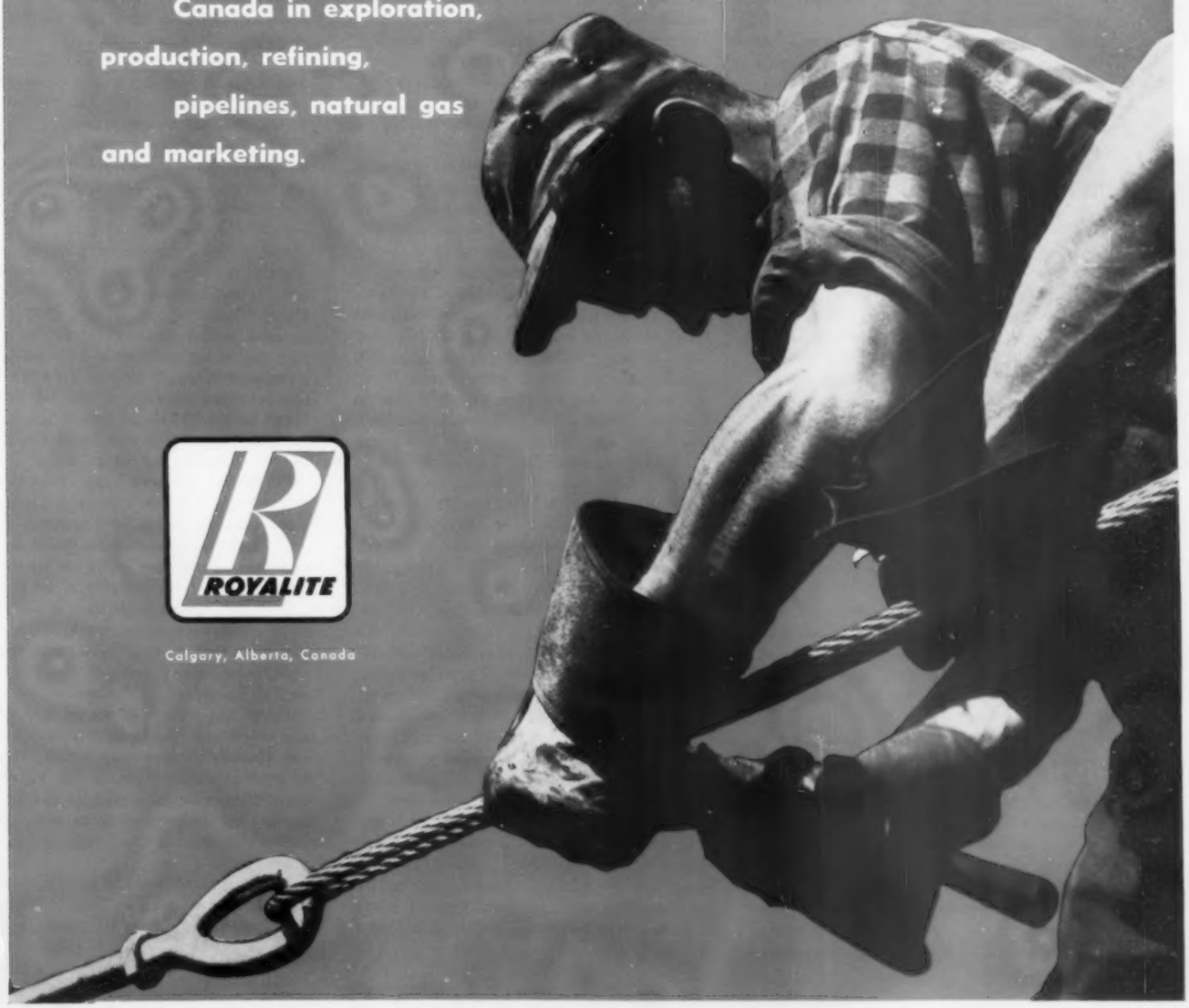


ROYALITE

Calgary, Alberta, Canada

Borden Commission examines gas

by Frances von der Lin

Editor's Note: As this issue went to press, submissions to Borden commssion on oil had not yet been made. The following summarizes sentiment with respect to gas only. Oil will be summarized in a subsequent issue.

APPOINTED by Prime Minister Diefenbaker to appraise Canada's overall energy picture and hand down findings and recommendations for best utilization of energy resources, the royal commission under leadership of noted industrialist Henry Borden, QC, has received a flood of information from key segments of the petroleum industry. Announcement by Chairman Borden of an interim report on "certain aspects" of the industry (submissions dealing with oil were scheduled for later sittings to be held during April in Calgary) raised hopes in the industry that long-awaited decision on the federal-government level regarding export of Canadian gas to USA markets would be forthcoming.

The keenly anticipated interim report is expected to contain two positive conclusions of vital importance to the industry: (1) Canada has huge gas reserves for staying 30 years ahead of its own requirements. After these domestic requirements have been met—with large growth in future domestic markets fully considered—an exportable surplus will exist. (2) Logical markets for this surplus are in the USA and, without these markets, the Canadian gas industry will never realize its full potential.

But taking into account the tone of the hearings, the interim report appears certain to contain the hard-fisted stipulation that prices charged to USA users of Canadian gas must compare favorably with domestic prices of this gas to obviate any possibility of service to the USA being "subsidized" by Canadian producers and consumers.

Trans-Canada, as well as other oil and pipeline interests, made submissions pertinent to overall aspects of conditions in the gas industry—producing the following key data for use by the commission in building an interim report:

Oil & Gas Conservation Board: Alberta's ultimate oil reserve—including all production—is estimated at 15 billion barrels, with estimated gas reserves of 60 to 83 trillion cubic feet—compared with net proved reserves at end of 1957 of 3.1 billion barrels of oil and 21 trillion cubic feet of gas reserves, out of which 18.3 tcf are considered within economic reach now.

Canadian Petroleum Assn.: Western Canada's potential gas reserve conservatively amounts to 300 trillion cubic feet (topped by additional 8 trillion estimated by British American Oil)—with ultimate recoverable oil at conservative 50 billion barrels as a compromise between higher estimates of 60 to 75 billion. Canada's total probable and proved gas reserves were estimated by CPA at about 30 trillion cubic feet at end of 1957. In thousands of barrels, probable and proved oil and liquids were estimated at 4,355,677 for all Canada as of that date.

British American Oil Co.: An annual drilling program of 1,000 exploratory wells would build marketable gas reserve, before production of 134 trillion cubic feet by 1982—compared with cumulative consumption of 27.8 trillion in Canada within next 25 years. Thus, the reserve left in 1982 would be about 106 trillion cubic feet. Deducting from an estimated present 27.5-trillion-cubic-feet marketable gas reserve 12.7 trillion for domestic consumption during next 25 years at current rates, plus presently contracted export, leaves a present surplus of 14.8 trillion cubic feet.

Pending Export Applications: Trans-Canada Pipe Line has contracts (awaiting government approval) involving sale of 200 mmcf to Midwestern Gas Transmission Co., at Emerson, Man., and interruptible sale of gas up to 200 mmcf daily at Niagara to Tennessee Gas Transmission Co. Westcoast transmission (with Pacific Northwest Pipeline) plans initial export of 150 mmcf daily to the California market, plus 250 mmcf daily additional from Peace River gas area for its existing 650-mile line to Canada's West Coast. Alberta & Southern has made application to serve California market with initial deliveries of 450 mmcf daily under project planning backed by Pacific Gas & Electric Co., San Francisco.

Prices: Contract between Westcoast and Pacific Northwest involves price of 22¢ per mcf of Canadian natural gas—compared with 32¢ charged B.C. distributors — B.C. Electric Co. and Inland Natural Gas Co. Commission counsel Arthur Pattillo hit hard during cross-examination at the difference in price—suggesting price revisions favoring Canadian consumers. Defending their price, Westcoast officials maintained volumes and conditions were different; that 22¢ was determined on a competitive basis; that pipeline project serving B.C. was made possible by initial gas sales in the USA.

It was estimated that comparative prices charged by Trans-Canada (should export at Emerson be approved) would average about 29¢ for USA customer, against 25¢ for Canadian user. In that, Trans-Canada expects a deficit of $185,597 during first year of proposed export.

Magnitude of future Canadian markets in its service area was emphasized by Trans-Canada—disclaiming interest in future USA markets beyond those now contemplated.

Canadian gas sales within next 31 years (to 1987-88) will amount to 18,776,132 mmcf, according to study on Trans-Canada's present and potential Canadian and export markets for natural gas. (Study was prepared by Ralph S. Orme, natural-gas consultant.) Trans-Canada now has authorization to export 4.35 trillion cubic feet from Alberta. Due to increased Canadian demand, additional 2.5 trillion will be sought during next five years. British-American emphasized "it is unrealistic to ignore potential growth and to appraise the adequacy of reserves to meet future needs solely on the basis of proven reserves' when determining Canada's exportable surplus.

As an authoritative voice for 274 exploration and producing companies accounting together for 97% of oil and gas produced in Canada, CPA noted that—due to lack of adequate markets—a cash deficit is keeping pace with Canada's mounting reserves.

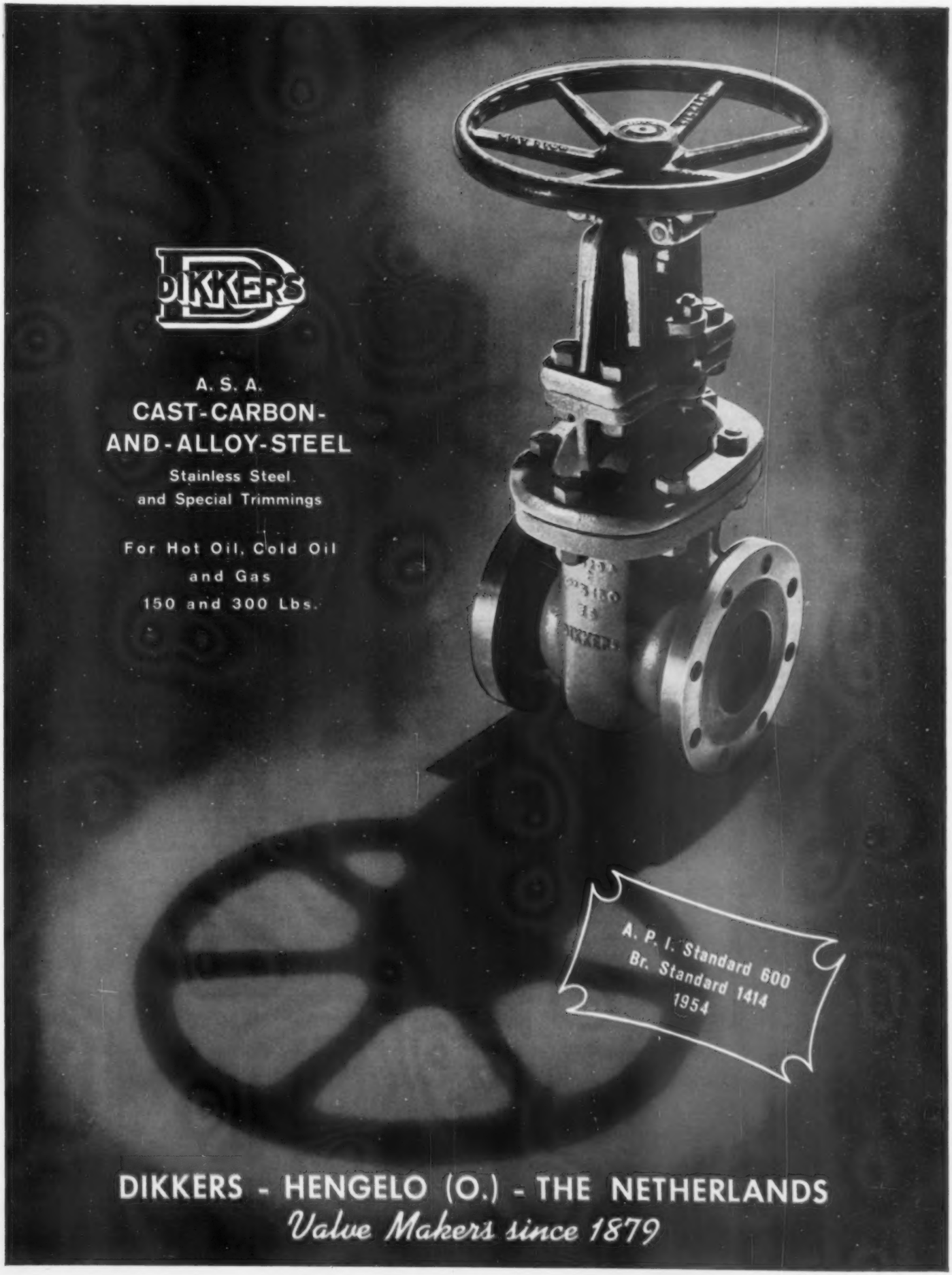
CPA reported a deficit of $936 million had been incurred by the industry during a sample period of 1951-56.

The following comments point up the feeling in the industry as expressed at commission hearings: *Westcoast Transmission*—"There is real danger that lack of decision with respect to marketing of surplus gas at an early date will cost Canada a permanent loss of some of the more lucrative potential markets for natural gas. . . . It can very well be that (years hence) other fuels will have been developed which could render Canadian gas superfluous."

Canadian Western and Northwestern Utilities: "(We) have been concerned for some time lest rising field prices of natural gas, coupled with other increases in costs, result in natural gas losing its place as the lowest cost fuel for industry in the province. . . . It seems inevitable that, if we wish to have our gas resources developed, we must also have export of gas in sizeable volume."

Jefferson Lake Sulphur: "There is a great deal to be gained in Canada in proceeding without any delay to secure for Canada markets for the gas to be produced in western Canada at favorable prices. This will mean that sulphur plants can be erected. . . . Otherwise sales in such markets will be met by competition from other sources where production of sulphur is now planned."

Before returning to Calgary, the commission planned sessions in Toronto and Regina —with sittings at later dates scheduled for Victoria, Vancouver, and Winnipeg. END



IN CANADA: DIKKERS, LTD., SCARBOROUGH, ONTARIO

Manitoba operations steady

Production increased slightly during 1957, and the development success ratio was fairly good. Operations are slowing, however, with lack of new field discoveries.

by Leslie Orr Rowland
Editor, *Oil in Canada*

Manitoba—in spite of its lower producibility, the effect of declines in the older wells, and the near exhaustion of drillable locations—managed to raise its production by a small margin. Production had a mixed pattern—rising to a high in the fall and slackening off to the end of the year for an average of 16,711 b/d, compared with 15,810 b/d in 1956.

Manitoba wells produced to the limit of their operating capacity all through the year, in line with the policy of the provincial government—which, in cooperation with the industry, calls for all-out production as long as producibility is lower than the refining capacity within the province. Oil production last year was just over half the total of refinery runs. Actually, Manitoba distribution of production was not so simple as the position on balance; because of crude-oil characteristics, about 7,000 b/d average went into the export stream, the balance to Ontario refineries, and the local refineries were supplied by Saskatchewan crude.

Trans-Prairie had a throughput of 23,600 b/d from its combined Saskatchewan and Manitoba operations—having started in Saskatchewan just at the end of 1956. Manitoba throughput was over 16,500 b/d in 1957—up slightly from 1956, while Saskatchewan traffic averaged 7,000 b/d from a standing start.

Manitoba development drilling in 1957 was highly selective—with heavy concentration in two of the three major fields. Of the 224 completions in both categories—a moderate decline of 15% from 262 completions in 1956—development wells numbered only 159, a drop of 27% from 218 the previous year. Wildcatting, to the surprise of the industry, showed a large increase of nearly 50% to 65 wells, compared to 44 in 1956.

The market factor stimulated wildcatting in Manitoba, as the prospect of utilization of oil outweighed the lack of success during the year. The low cost of drilling exploratory wells to the usual objective of the Mississippian limestone formation—a matter of 2,500 ft to 3,000 ft in most cases—made wildcat costs much lower on the average than in Saskatchewan or Alberta, and this was an additional encouragement.

The development success ratio in Manitoba was moderately good—with 131 oil wells completed, against 20 dry holes; while eight wells were drilled for saltwater disposal. The North Virden field led the way with 68 development wells; Virden-Roselea was second, with 57 wells; and Routledge—undergoing a revival of interest because of success in fringe drilling—had 23 completions.

Only one discovery was made, in a wildcat three miles southwest of the Routledge field; but it has indicated the presence of a fairly good pool with 30 to 40 well sites. Designated West Routledge, it is currently receiving more attention than any of the other fields at a time when well stakings are down to two or three a week.

At the end of the year, Manitoba had 848 wells capable of producing oil—with 734 actually on production.

Stability in the purchase of crude from the greatly increased number of wells in 1957 was achieved by the concentration of most contracts in the hands of Great Northern Oil Purchasing Co. This company started operations in the summer of 1955, organized as a subsidiary of Great Northern Oil Co., which operates the major refinery in St. Paul, Minn., and under parent ownership of the same group of companies which controls most of the medium-gravity crude production in the southwestern fields.

Great Northern increased its business to 44,270 b/d average, from 1956 volume of 33,073 b/d. The rate of growth was not so great as the relative total figures because the volume of purchases fell off in the second and third quarters, but the December average of 53,384 b/d showed a 30% gain over January's 41,470 b/d. Business continued the strong upward trend in January and February of this year—reaching another new high of 62, 394 b/d in February. The purchases included the 7,000 b/d average from Manitoba, which has grown in current volume to a figure ranging from 11,000 b/d to 14,000 b/d in the first quarter of 1958.

The record of Great Northern's purchases demonstrates the extremely important position of the export market for Saskatchewan and Manitoba. Out of combined oil production of almost 43,000,000 bbl, 14,000,000 bbl, or 32%, went to destinations in the United States. Far from being affected adversely by the import quota system, this traffic is headed for a substantial increase in 1958, and there are indications the Carson committee will continue to recognize the necessity for using Canadian crude of the Saskatchewan type in northern states' refineries.

The year just past was an "off" year for refinery

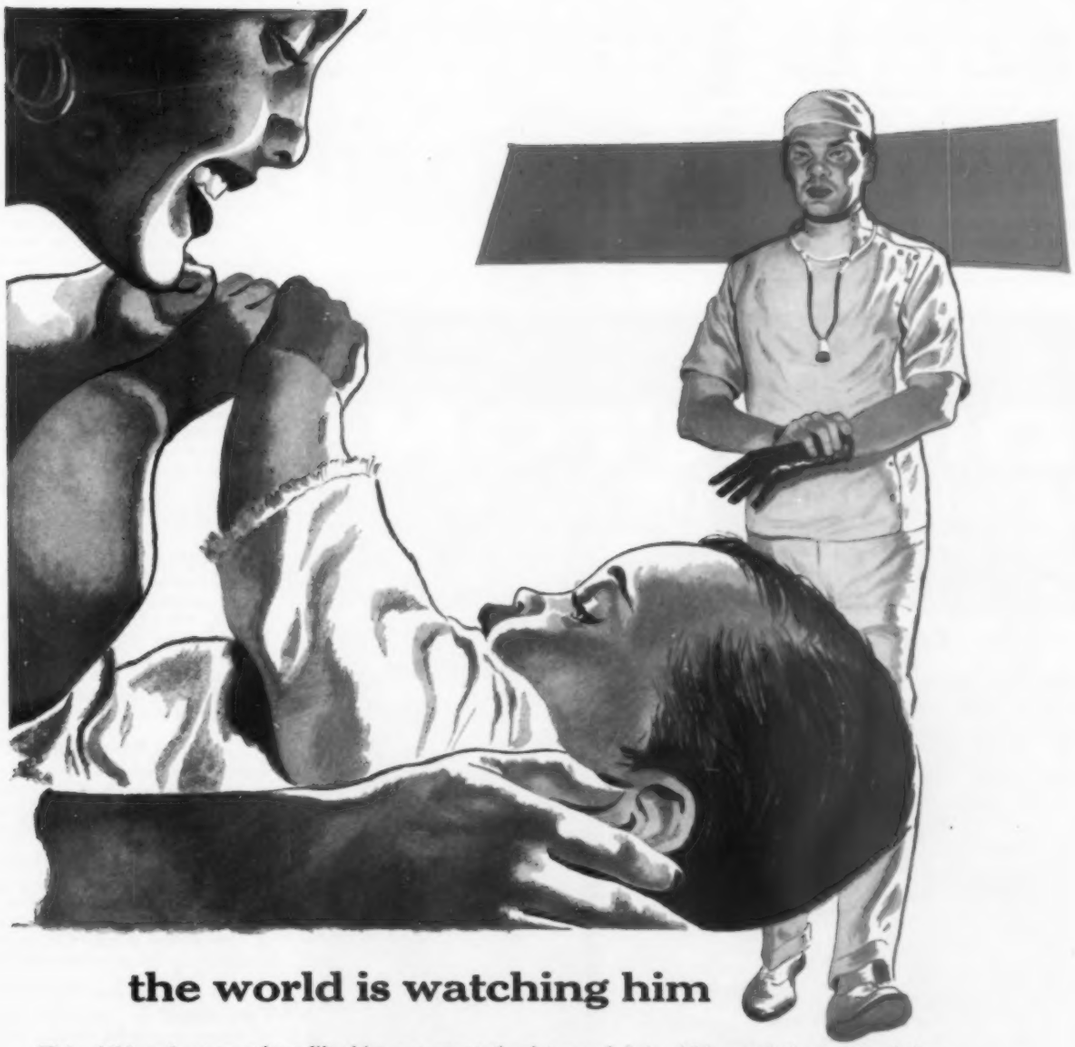
Table I
Manitoba—Drilling and Production, 1957

Month	Crude-Oil Production (Barrels)
January	496,135
February	462,807
March	518,787
April	473,996
May	487,165
June	509,001
July	541,181
August	539,085
September	524,954
October	530,660
November	495,419
December	510,105
Year Total	6,089,473

Month	Footage Drilled
January	64,138
February	56,050
March	48,797
1st Quarter	168,985
April	...
May	32,203
June	95,084
2nd Quarter	127,287
July	61,507
August	52,867
September	21,216
3rd Quarter	135,590
October	23,116
November	28,422
December	33,033
4th Quarter	84,571
Year Total	516,433

Table II
Manitoba—Drilling Statistics, 1957

Month	Development Wells					Wildcat Wells				Combined Total Wells				
	Oil	Gas	Dry	SWD	Total	Oil	Gas	Dry	Total	Oil	Gas	Dry	SWD	Total
January	18	..	5	..	23	..	..	6	6	18	..	11	..	29
February	16	..	..	..	16	..	..	8	8	16	..	8	..	24
March	18	..	1	1	20	..	..	3	3	18	..	4	1	23
1st quarter	52	..	6	1	59	..	..	17	17	52	..	23	1	76
April	..	..	..	..	..	..	..	..	..	..	..	..	..	..
May	9	..	1	1	11	..	..	4	4	9	..	5	1	15
June	25	..	2	..	27	..	..	14	14	25	..	16	..	41
2nd quarter	34	..	3	1	38	..	..	18	18	34	..	21	1	56
July	14	..	4	3	21	..	..	5	5	14	..	9	3	26
August	7	..	2	1	10	..	..	11	11	7	..	13	1	21
September	4	..	1	1	6	..	..	3	3	4	..	4	1	9
3rd quarter	25	..	7	5	37	..	..	19	19	25	..	26	5	56
October	4	..	1	1	6	..	..	3	3	4	..	4	1	9
November	6	..	1	..	7	1	..	4	5	7	..	5	..	12
December	10	..	2	..	12	..	..	3	3	10	..	5	..	15
4th quarter	20	..	4	1	25	..	..	10	11	21	..	14	1	36
Year total	131	..	20	8	159	1	..	64	65	132	..	84	8	224



the world is watching him

This child and many others like him represent the future of Asia, Africa and the lands of the Pacific. Everywhere throughout this vast area there are new stirrings of light and life. There is a new demand for modern ways that will turn over to machines the work now done by the muscles of men and animals.

This calls for more of the energy that petroleum supplies in so many forms. And here Standard-Vacuum is doing its part. For Stanvac operates wholly within these areas exploring, drilling, producing, transporting and refining oil to meet the growing needs of their huge populations.

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STANDARD-VACUUM OIL COMPANY POWERS PROGRESS

White Plains, New York

construction in the eastern prairies, as large expansion programs undertaken in the previous two years had set up the refineries for several years ahead. Only one significant project was put under construction. This was the enlargement of the Imperial Oil Ltd. refinery at Winnipeg to 17,500 b/d rated capacity and 20,500 b/d maximum, from its former capacity of 15,000 b/d, and the installation of a new Powerformer catalytic reforming unit.

The Imperial job was near completion at the end of the year—with the crude-handling facilities already finished and the rest of the work due for delivery at the end of March. The Powerformer, with rated capacity of 3,150 b/d, is designed to provide increased octane rating for components of gasoline, in line with the demand for higher-powered fuels for greater automotive compression ratios. The total cost of the combined installations is estimated at $4 million to $5 million.

The experimental work—which has featured the Imperial Winnipeg refinery since its start of construction in 1950—was carried forward last year with the radically different treatment of the Powerformer compressors. Instead of being enclosed for weather protection, they were built open on one side. This weather exposure was designed for the dual purpose of making an economy in capital cost and determining—as operating experience builds up—whether the savings are matched by operating efficiency equivalent to that of housed compressors. The record of cold-weather experimenting so far has been completely successful at the Winnipeg refinery—including its use, for the first time in a cold climate, of unhoused pumps and boilers.

A smaller expansion program for the Winnipeg refinery of North Star Oil Ltd. was announced in the fall, but the construction contract was not awarded until March of this year. Not involving any increase in throughput rating, the North Star capital outlay of $1.5 million will be spent on a Platformer with capacity of 2,700 b/d. It will provide facilities for production of blending components of high-octane gasoline with a leaded octane rating of 100 or more.

Value of oil production in Manitoba exceeded the rate of growth—with an estimated value of $15 million last year, against a 1956 value of $13.3 million.

Both Manitoba and Saskatchewan felt the effect on local business and industry of the big construction job on the main line of Trans-Canada Pipe Lines Ltd. between Regina and the Manitoba-Ontario border. The five construction spreads which laid the 370 miles of 34-in. and 30-in. pipe, for what will eventually be the longest natural-gas pipeline in the world, contributed greatly to employment of local labor and purchases of local commodities, both for the line and for personal use. The pipeline itself brought natural-gas service to Regina in Saskatchewan, and to Brandon, Rivers, Portage la Prairie, and Winnipeg in Manitoba.

It would be rather reckless to forecast at present how soon the upward trend of the petroleum industry in western Canada will resume its pace of the last few years before 1957, but it is a safe appraisal of Saskatchewan and Manitoba to say that they will not experience any noticeable setback in either drilling or production in 1958—as long as political relations between the United States and Canada remain as favorable as they have been, even through the very difficult economic conditions of the past 10 months in both countries. END

CANADA

New Industrial horizons are opening in the Canadian West with Edmonton the focal point.

Industrial and commercial development in the Edmonton area during the past decade has topped the $500,000,000 mark and continues at a steadily increasing rate.

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THE CITY OF EDMONTON

FOR INFORMATION WRITE: NORMAN A. RAULT, INDUSTRIAL DIRECTOR

The City of Edmonton, City Hall, Edmonton, Alberta, Canada

Alberta's Income To Decline

Alberta government has budgeted for a decline of $16,700,000 during the coming fiscal year in oil income as a result of "present uncertainty" surrounding markets for oil and gas. Total oil revenue is forecast at $103,050,000, compared with $119,750,000 for fiscal year ending March 31. Total fiscal income is expected to amount to $263,693,585.

Markets Limit Canadian Exports

Markets—not quotas—are only limit on Canadian crude exports. Interim report and schedule for first half of 1958 by Carson Committee shows effective quota to USA District II now 94,500 b/d because of deficiency in second half of 1957. Current exports are still under 80,000 b/d. West Coast exports first quarter of 1958 will be under quota by 28,000 b/d average, or 40%.

Trans Mountain Deliveries Rise

Trans Mountain Oil Pipe Line Co.'s total deliveries of crude for month of February 1958 were 95,166 b/d. Scheduled deliveries through the system for March were expected to average 100,000 b/d.

Nova Scotia For BA Oil Terminal

British American Oil Co. will build its first finished oil-products marine terminal in Nova Scotia. On a 30-acre site near Halifax, its initial storage capacity of nine million gallons will make it the largest BA distribution center in the Atlantic provinces.

Canadian Gas For Export Market

Submission by a group of nine small independent oil companies to the Borden commission on energy resources said interest charges should be assessed against idle natural-gas reserves at rate of 8/10 of a cent per mcf per year for evaluation purposes. Group argued this was strong grounds for immediate policy of permitting gas to seek export markets.

North Star Contract To Procon

Procon (Canada) Ltd. has been awarded contract for construction of a combination UOP Platforming-Unifining unit at North Star Oil Ltd. refinery, St. Boniface, Manitoba—as part of North Star's expansion program. Cost of project is expected to exceed $1 million.

Canadian Statistics

Stanford Research Institute has announced publication of *Canadian Resources, Part I*, a volume of selected statistics relating to the natural resources, and the industrial and commercial development of Alberta, British Columbia, Manitoba, and Saskatchewan. Its 125 data sheets give detailed information on each province's climate, general economic indicators, population, employment, income, agriculture, energy, manufacturing, construction, and transportation. The material is presented in tabular form supplemented by graphs, charts, and maps. Volume will be supplemented at a later date by information on other areas of Canada.

Copies of *Canadian Resources* may be obtained at $10 each from the editor, Western Resources Handbook, Stanford Research Institute, Menlo Park, Calif.

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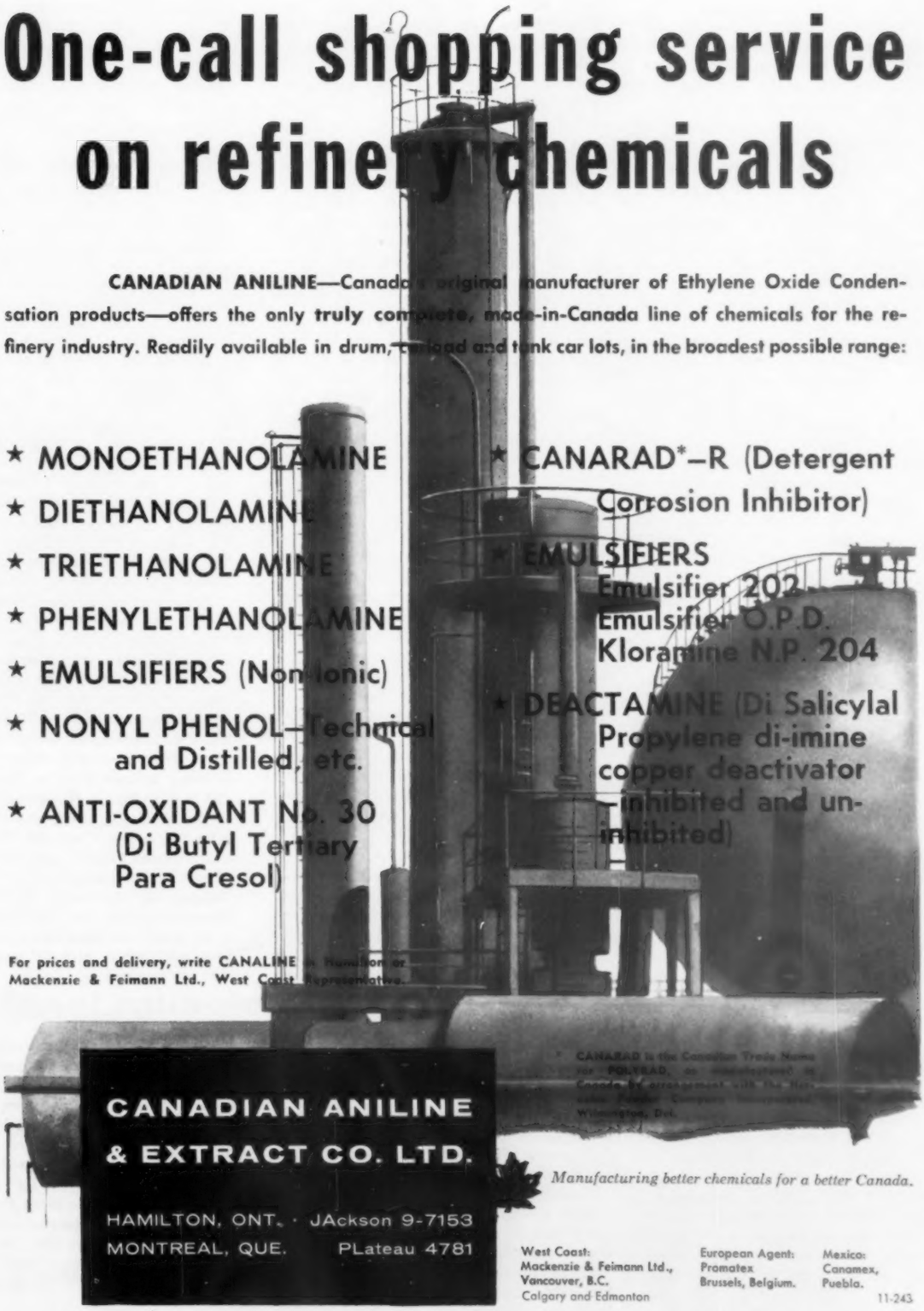

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11-243

Exploration Up

(*Continued from page 77*)

strike itself has also taken place, and results are encouraging. A rank wildcat located east of the new Beaverhill Lake productive area, Hudson's Bay East Virginia Hills #9-20 (9-20-65-13 W5), discovered gas in the Gilwood sand, a post-Middle Devonian "granite wash" which has produced to a minor extent in the Peace River region.

Other widely separated Leduc reef discoveries were made at Canadian Export Gas-Cree-Wood River #6-16 (6-16-43-23 W4), 9 miles southwest of the Malmo reef pool, and at Fina-Stanolind Hudson's Bay Silver Creek #15-25 (15-25-60-16 W5) in the Windfall area. Wet gas had been obtained earlier from the same horizon in the latter vicinity.

Extensive development of a new Nisku (Devonian D2) pool toward the western end of the Joffre Viking trend took place during the year. The discovery well, White Rose et al.-N. Joffre #3-20 (3-20-39-26 W4), was completed near the end of 1956.

In horizons of Mississippian age, other interesting developments, in addition to those already discussed, took place. Some 3½ miles east of the Harmattan-Elkton field, a new pool was discovered at Shell-Canadian Superior-Elkton #C-7-24 (7-24-32-4 W5). Between this area and the city of Calgary, Mississippian wet gas was encountered at Tennessee West Crossfield #1-20 (1-20-28-2 W5), which also found a thin noncommercial oil leg; and at Jefferson Lake North Calgary #27-6 (6-27-25-29 W4). This latter discovery was made in the course of developing the prolific East Calgary sour-gas field, which produces from the Crossfield member of the Wabamum formation (Devonian D1). In the southern part of the province, west of Lethbridge, Pan-American #A-1 Blood Indian Reserve (8-23-6-24 W4) is apparently capable of commercial oil production in an area of several previous noncommercial shows. The Savanna Creek field, in the mountains, southwest of Turner Valley, capable of producing Mississippian gas high in sulfur, was further extended during the year.

Saskatchewan

Saskatchewan's exploratory drilling accounted for 32% of the western Canada total. Most of the wells were confined to the extreme southeastern part of the province, with a secondary concentration in the Swift Current and Kindersley areas. Scattered holes were drilled elsewhere—particularly toward the basin margin in the northern part of the province, where the majority were "basement" tests. 59% of exploratory wells bottomed in strata of Mississippian age (Fig. 5); 14% reached the Devonian; only 12%—most of which were pre-Cambrian tests—went deeper. 15% stopped in the Mesozoic.

Saskatchewan exceeded Alberta for the first time in development drilling—882 completions to 877. The bulk of this activity took place, as in the case of exploratory work, in the southeastern sector of the province—with the Mississippian Charles and Mission Canyon formations the objectives. Most of the remaining holes were drilled in the Bone Creek, Cantuar, Coleville, Instow, Lloydminster, and Whiteside fields.

Discoveries: Of a total 345 exploratory wells drilled in the province during 1957, fifty-five discovered oil, and five gas. This is a success rate of 17%—down from the 1956 level of 28%. Of the oil wells, the vast majority were drilled in the prolific Mississippian producing area of the southeast, and extended previously productive areas or developed new pools adjacent to them. The gas wells, all Cretaceous, were located in the Swift Current, Kindersley, and Lloydminster areas.

Two oil discoveries will be discussed in some detail, as they appear to have particular significance. About 10 miles south of the main Weyburn-Carnduff trend, which produces largely from the Midale zone (Charles), White Rose-Colorado-Paramount Pinto #16-35 (16-35-1-5 W2) was completed as a commercial well from the same horizon. The general area had previously seen only scattered dry holes. The other discovery, Riddle-Tidewater Rocanville Crown #16-32 (16-32-15-31 W1), lies north of defined productive trends; it established a new producing horizon for the area, the Bakken formation (basal Mississippian). Shows in this zone had been reported previously from wells in the vicinity.

A well located toward the deeper part of the Williston Basin, Imperial Hummingbird #6-13 (6-13-2-19 W2), drill-stem-tested the Ordovician toward the end of the year, and recovered some free oil with water. This is the first Ordovician oil in the province—and, regardless of the outcome of the well itself, increased drilling to pre-Mississippian objectives should result.

Manitoba

Manitoba scored a 70% increase in exploratory drilling in 1957—75 wells, compared with 44 in 1956. Development completions, however, fell from 210 in 1956 to 150, a decline of 29%. Activity was almost exclusively confined to the extreme southwestern corner of the province—although scattered tests were drilled northward and eastward, many of them beyond the erosional limit of the Mississippian. 40% of all exploratory tests bottomed in the Mississippian; the remainder, with the exception of one Mesozoic test, proved deeper. Nineteen, or 26%, reached the pre-Cambrian. Only four exploratory wells found commercial production—all oil—from the Lodgepole (Mississippian); and, of these, three extended areas of proved production. Only one resulted in a new field discovery, Dillman-Plymouth Kirkella #1-10 (1-10-12-29 W1), approximately 12 miles northwest of the Daly field, and 4 miles east of the Saskatchewan border.

Northeastern British Columbia

Exploratory activity increased over 100% compared with the 1956 level—61 completions to 27. Of these, 64% were bottomed in Mesozoic strata, usually Triassic; 28% reached the Mississippian; and 8% were deeper tests. Three of these, 5%, contacted the pre-Cambrian. Most of the wells were scattered through a broad path between Dawson Creek and Fort Nelson. Of the 30 successful exploratory wells drilled (49% of the total), six found oil and the remainder natural gas.

Four oil discoveries are considered of particular significance. Imperial-Pacific Boundary #11-10 (11-10-85-14 W6) and Imperial-Pacific Alces #1-23 (1-23-84-14 W6), located respectively 5 miles and 9 miles southeast of the Boundary Lake field, both found commercial production from the Triassic, in the same horizon as the field itself. Near Mile 100, Alaska highway, in the Blueberry area, two wells, J. B. White Blueberry #11 (10-22-89-25 W6) and J. B. White Blueberry #16 (46-D-13-A-94)*, some 5 miles apart, discovered Mississippian production in a previously proved gas area. One other well, Hudson's Bay Milligan Creek #1 (73-G-94-H-2), located some 25 miles northeast of the Buick Creek gas area, yielded Triassic oil on drill-stem test, but is not included in the statistics because of its suspended classification. Recent developments in the area have indicated this recovery to be highly significant.

The gas discoveries were scattered throughout the area of activity, from Sinclair-Canadian Atlantic #B-6-1 (6-16-81-14 W6), a Mississippian discovery some 15 miles north of Dawson Creek, to Gulf States Prophet River #1 (10-J-10-J-94), located a few miles south of Fort Nelson. This well produced from the Devonian Slave Point formation. Other wildcat discoveries include Phillips Townsend #A-1 (20-H-9-B-94), a Mississippian well west of the Blueberry area; and Canadian Decalta Big Arrow Creek #1 (71-F-94-H-2), which found Triassic gas, four miles west of the H. B. Milligan Creek #1 indicated Triassic oil discovery, discussed above. Others were for the most part located in areas where gas production had previously been established, and did not particularly indicate new trends.

Northwest Territories

Four exploratory wells—all dry—were completed here during 1957, one more than in 1956. Two bottomed in the Devonian, one in the Permo-Pennsylvanian, and one in the pre-Cambrian. All were located in the area generally southwest of Great Slave Lake. One offset well, D. Todd Briggs Rabbit Lake #3 (60° 56′ N, 118° 46′ W), was capped as a Devonian Slave Point potential gas producer, and is located a short distance from Rabbit Lake #1 (60° 56′ N, 118° 47′ 30″ W), the discovery well, which was drilled in 1955. (*More on page 122*)

* Only the "Peace River block" of northeastern B.C. is surveyed into townships. Wells outside this area are located by means of a new grid system based on divisions of the National Topographic Series.

Below: Electrical conductors, left to right:
3-conductor #8 Aluminum Armoured Teck Cable, with neoprene jacket.
3-conductor #4 Aluminum Sheathed Cable, with p.v.c. (plastic) jacket.
3-conductor #6, with ground wire, Tufflex Heavy Duty Portable Cable.

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57-202

(Continued from page 120)

TABLE II

IMPORTANT DISCOVERIES IN WESTERN CANADA—1957

Map Index	Operator	Well Name	Well Location	Basis for Location	Comp. Date	Total Depth (Feet)	Prod. Depth (Feet)	Init. Prod.	Gravity API (Deg.	Prod. Form.	Deepest Form. Tested	Field or Pool	Remarks
	British Columbia												
1	Sinclair-Canadian Atlantic	#B-6-1	6-16-81-14 W6	Seis.	11/26	12,685	8,330	1,700 MCFD		Upper Rundle	Devonian		Significant discovery in relatively undrilled area.
2	Imperial Pacific	Alces #1-23	1-23-84-14 W6	Seis.	4/17	4,516	4,437	51 BOPD	—	Trias.	Trias.		Possible new pool 4 miles south of Imperial Pacific Boundary #11-10 below.
3	Imperial Pacific	Boundary #11-10	11-10-85-14 W6	Seis.	2/14	4,553	4,102	173 BOPD	32	Trias.	Trias.		Discovery 5 miles S.W. of Boundary Lake oil field.
4	J. B. White-Lloyd	Blueberry #11	10-22-89-25 W6	Seis.	1/7	7,048	6,875	Not estab.	—	Miss.	Miss.		Oil discovery. Also indicated Triassic gas production.
5	J. B. White-Lloyd	Blueberry #13	50-K-12-A-94	Seis.	6/21	6,881	6,748	8,800 MCFD		Rundle	Miss.		Significant extension. Several horizons capable of production.
6	J. B. White	Blueberry #16	46-D-13-A-94	Seis.	9/5	7,293	7,136	304 BOPD	39.9	Miss.	Miss.		4 miles N. of Blueberry #11 above.
7	Phillips	Kobes #A-1	35-A-9-B-94	Seis.	2/14	8,195	5,545	2,200 MCFD 8,300 MCFD		Trias. "C" Trias. "D"	Miss.		Significant extension. Dual-zone production.
8	Phillips	Townsend #A-1	20-H-9-B-94	Seis.	5/1	7,299	7,164	22,000 MCFD on DST.		Rundle	Miss.		New producing zone in area.
9	Gulf States	Gundy #4	4-B-16-B-94	Unknown	9/9	7,018	4,237	9,700 MCFD on DST.		Trias.	Miss.		5 miles W. of established producing area.
10	Richfield Canadian Decalta	Big Arrow Creek #1	71-F-94-H-2	Unknown	3/30	5,070	4,550	3,000 MCFD on DST.		Trias.	Miss.		25 miles N.E. of Buick Creek gas area.
11	Gulf States	Prophet River #1	10-J-10-J-94	Seis.	1/28	6,969	6,555	13,000 MCFD on DST.		Slave Point	Elk Point		Significant wildcat discovery.
	Alberta												
12	Shell	Waterton #1	4-21-4-1 W5	Seis.	30/4	14,045	12,212	6,000 MCFD; 30 bbl. cond./MCF		Miss.	Cairn (Devonian)		10 miles S.W. of Pincher Creek field.
13	Pan American	#A-1 Blood I.R.	8-23-6-24 W4	Seis.	10/11	6,878	6,350	Not estab.	42	Miss.	Banff		First commercial well in area.
14	Texaco	Castle River #A-3-4	3-4-6-2 W5	Sub., Seis.	11/8	12,063	11,342	5,000 MCFD		Miss.	Miss.		Possibly same reservoir as Shell Waterton #1 above.
15	Texaco C & E	High River #12-19	12-19-18-29 W4	Seis.	27/6	10,007	9,500	4,000 MCFD		Miss.	Wabamun		New producing zone for area.
16	Jefferson Lake Sulphur Co.	North Calgary #27-6	6-27-25-29 W4	Unknown	15/7	8,923	7,432	8,000 MCFD; 20 bbl. cond./MCF		Elkton	Wabamun		New producing zone for area.
17	Tennessee Gas Transmission	West Crossfield #1-20	1-20-28-2 W5	Sub.	31/8	8,708	8,620	Not estab.	—	Elkton	Miss.		As above; also has thin oil leg.
18	Shell Canadian Superior	Elkton #7-24	7-24-32-4 W5	Sub., Seis.	30/7	8,635	8,598	1,689 BOPD	38.6	Elkton	Shunda	Harmattan East	3½ miles east of Harmattan field.
19	New Superior et al. H.B.	Garrington #4-20	4-20-34-4 W5	Seis.	5/7	9,202	7,866	11,000 MCFD; 48 bbl. cond./MCF		Viking	Banff		New producing zone for area.
20	Hudson's Bay	Sundre #11-10	11-10-34-5 W5	Sub.	25/11	9,353	8,863	286 BOPD	45.1	Basal Cretaceous	Shunda	Sundre	New producing zone; on N.E. flank of Sundre Miss. oil field.
21	White Rose C & E	Innisfail #1-16	1-16-35-1 W5	Sub., Seis.	15/5	8,650	8,498	509 BOPD	43.3	Leduc	Leduc	Innisfail	Important Leduc reef discovery.
22	Hudson's Bay et al.	Flag Lake #1	7-23-41-12 W4	Seis.	1/7	3,440	2,552	12 BOPD	35.8	Viking	Leduc	Bellshill Lake	New producing zone for area.
23	Hudson's Bay	Gilby West #4-18	4-18-41-3 W5	Seis.	12/3	7,200	7,142	30 BOPD	23.5	Pekisko	Banff	Gilby	New producing zone for area.
24	Canadian Export Gas-Cree	Wood River #6-16	6-16-43-23 W4	Seis.	14/7	5,711	5,711	232 BOPD	31	Leduc Reef	Leduc		New producing zone for area.
25	Union	Acheson East #2-30	2-30-52-25 W4	Sub.	23/10	5,710	3,996	57 BOPD	40	Basal Quartz	Cooking Lake	Acheson East	East of Acheson Leduc Reef field.
26A	Fina Pan Am. H.B.	Windfall #10-21	10-21-59-15 W5	Seis.	3/8	9,148	6,826	410 BOPD	36.6	Miss.	Leduc	Windfall	New producing zone for area.
26	Tennessee Gas Transmission	Crown Padstow #A-30-1	5-30-56-8 W5	Sub.	10/6	5,320	5,060	2,300 MCFD, 60' oil on DST.		Nordegg	Banff		
27	Fina Stanolind H.B.	Silver Creek #15-25	15-25-60-16 W5	Seis.	8/2	8,600	8,474	466 BOPD	40.5	Leduc Reef	Leduc		In area of established Leduc gas production.

Map Index	Operator	Well Name	Well Location	Basis for Location	Comp. Date	Total Depth (Feet)	Prod. Depth (Feet)	Init. Prod.	Gravity (Deg. API)	Prod. Form.	Deepest Form. Tested	Field or Pool	Remarks
28	Mobil	Whitecourt #12-13	13-12-61-12 W5	Seis.	3/5	9,343	8,943	18,800 MCFD, 160' cond. on DST.		Beaverhill Lake	Beaverhill Lake		Significant Beaverhill Lake discovery.
29	Hudson's Bay Union	East Kaybob #1	6-20-61-18 W5	Seis.	30/1	7,776	6,911	3,500 MCFD		Viking	Rundle		First Viking discovery in area.
30	Cal. Standard B.A.	Iosegun #7-33	7-33-63-19 W5	Sub., Seis.	6/10	10,194	10,066	627 BOPD	42	Beaverhill Lake	Gilwood		Significant Beaverhill Lake discovery.
31	Phillips	Kaybob #A-1	7-22-64-19 W5	Sub.	30/6	10,445	9,760	1,560 BOPD	42	Slave Point	Cambrian		Significant Slave Point (Beaverhill Lake) discovery.
32	Hudson's Bay	East Virginia Hills #1	5-31-65-6 W5	Sub.	9/8	8,422	7,110	Flow test—3,500 MCFD with cond. spray		Gilwood	pre-Cambrian		First Gilwood Ss. discovery in area.
33	Home-Union Hudson's Bay	Virginia Hills #9-20	9-20-65-13 W5	Seis.	29/7	10,624	9,282	864 BOPD	36	Slave Point	pre-Cambrian		First Slave Point (Beaverhill Lake) discovery in area.
34	Home et al. Regent	Edith Lake #11-19	11-19-67-10 W5	Seis.	16/11	9,572	8,294	696 BOPD	39.5	Slave Point	pre-Cambrian		Significant Slave Point (Beaverhill Lake) discovery. 20 miles N.E. of Virginia Hills #9-20 above.
35	Colorado-Okalta	Normandville #8-16	8-16-79-22 W5	Sub.	2/3	6,815	5,802	56 BOPD	39	Wabamun	Leduc	Normandville	New producing zone in Normandville Leduc reef oil field.
36	Colorado et al.	Normandville #14-20	14-20-79-22 W5	Seis.	10/1	3,344	2,650	74 BOPD	25	Jurassic	Miss.		New producing zone. 2½ miles N.W. of Normandville field.
37	Union	Red Earth #2-4	2-4-88-8 W5	Seis.	26/2	4,832	4,800	Not estab.	—	Granite Wash	pre-Cambrian	Red Earth	New pool in Red Earth area.
	Saskatchewan												
38	White Rose-Colorado Paramount	Pinto #16-35	16-35-1-5 W2	Sub., Seis.	9/13	5,680	5,370	85 BOPD	40	Charles	Mission Canyon		10 miles south of major producing trend.
39	Trans-Empire Baysel Can. Sup.	Halbrite #4-25	4-25-5-12 W2	Sub., Seis.	1/3	5,010	4,840	217 BOPD	31	Mission Canyon	Mission Canyon	Halbrite	6 miles S.E. of Weyburn field.
40	L.M. Shell	Halbrite #16-31	16-31-5-12 W2	Seis.	14/12	4,970	4,768	99 BOPD	27	Mission Canyon	Mission Canyon		3 miles S.E. of Weyburn field.
41	White Rose-Canadian Superior	Colgate #9-23	9-23-5-14 W2	Sub., Seis.	15/3	5,084	4,900	180 BOPD	29	Charles	Mission Canyon		2 miles S.W. of Weyburn field.
42	Mobil-Woodley Sinclair	East Bellegarde #X-9-29	9-29-6-30 W1	Sub., Seis.	6/26	3,325	3,208	76 BOPD	37	Mission Canyon	Lodgepole		
43	Imperial Tidewater	Arlington #4-10	4-10-6-34 W1	Seis.	15/7	4,015	3,800	158 BOPD	36	Mission Canyon	Mission Canyon		
44	Imperial	Dalesboro #15-5	15-5-6-3 W2	Sub., Seis.	3/10	4,460	4,122	88 BOPD	34.4	Mission Canyon	Mission Canyon	Dalesboro	
45	Imperial	Willmar #12-24	12-24-6-4 W2	Sub., Seis.	7/10	4,414	4,110	67 BOPD	36	Mission Canyon	Mission Canyon	Willmar	
46	White Rose-Canadian Superior	Redvers #3-31	3-31-7-31 W1	Seis.	3/17	3,473	3,390	67 BOPD	34	Mission Canyon	Lodgepole		
47	White Rose-Devon Palmer Can. Sup.	North Browning #1-7	1-7-7-5 W2	Sub.	6/6	4,160	4,054	70 BOPD	—	Mission Canyon	Mission Canyon		
48	Imperial Can. Superior	Parkman #4-31	4-31-9-33 W1	Sub., Seis.	6/8	3,660	3,488	58 BOPD	33	Mission Canyon	Lodgepole		
49	Imperial	Cannington Manor #16-31	16-31-9-1 W2	Sub., Seis.	10/18	3,850	3,710	129 BOPD	33	Mission Canyon	Mission Canyon		
50	White Rose-Devon Palmer Can. Superior	Adelaide #16-3	16-3-10-1 W2	Sub.	8/1	3,700	3,608	120 BOPD	34	Mission Canyon	Lodgepole		
51	Delhi H.P. Richfield	Garden #1	4-25-10-20 W3	Unknown	25/5	4,535	4,401	80 BOPD	—	Upper Shaunavon	Lodgepole		4 miles west of previous production.
52	Imperial	Hazelwood #16-21	16-21-11-5 W2	Sub., Seis.	11/12	4,125	3,960	82 BOPD	33	Mission Canyon	Lodgepole		
53	Riddle-Tidewater	Rocanville Crown #16-32	16-32-15-31 WPM	Seis.	8/20	5,308	2,300	34 BOPD	37	Bakken	pre-Cambrian		First Bakken discovery in area.
	Manitoba												
54	Dillman-Plymouth	Kirkella #1-10	1-10-12-29 W1	Sub.	19/9	2,752	2,409	74 BOPD	28	Lodgepole	Nisku		New producing area N.W. of major field.

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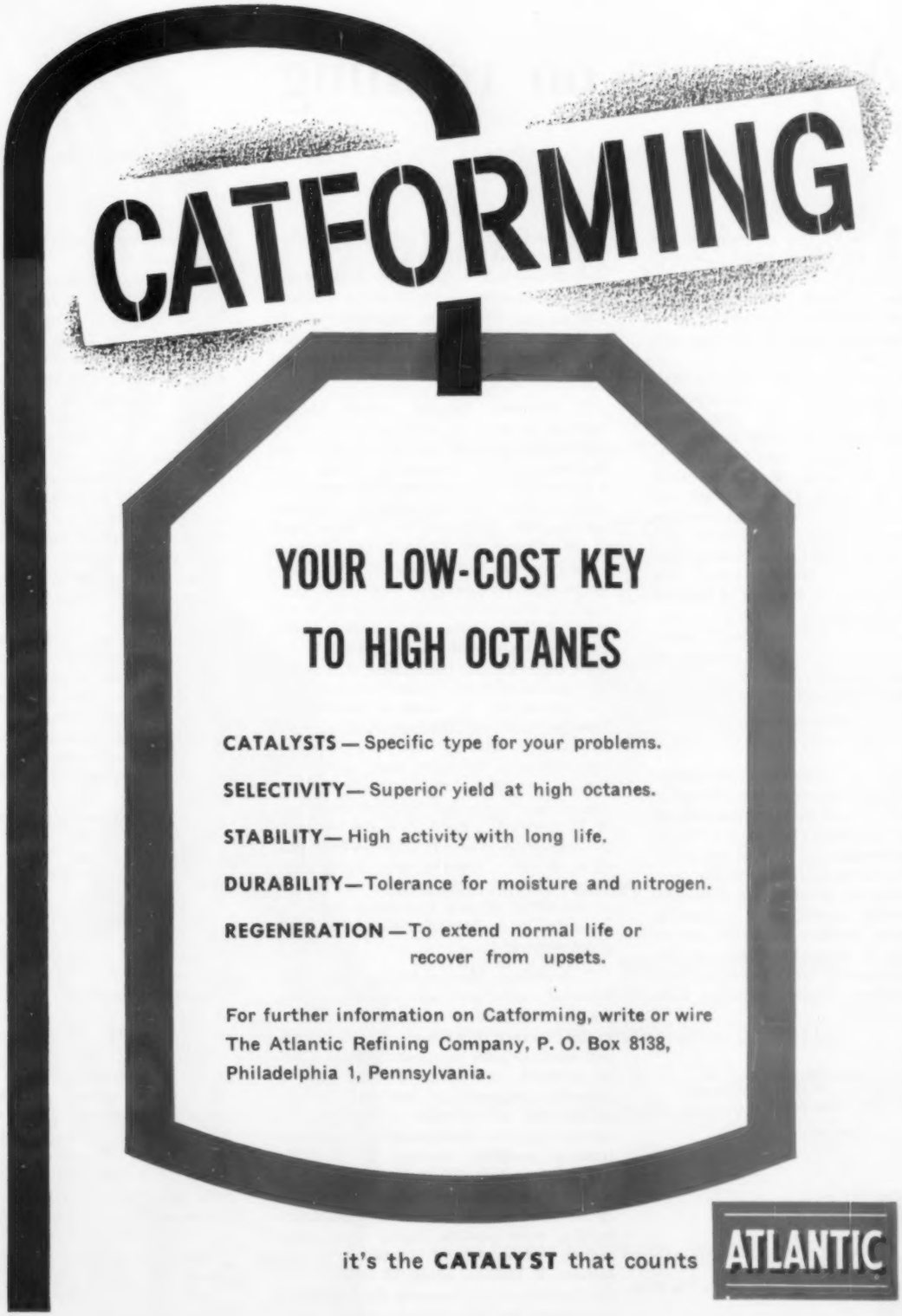
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Review of recent USA patents on refining

by Heinz Heinemann and Harold Shalit

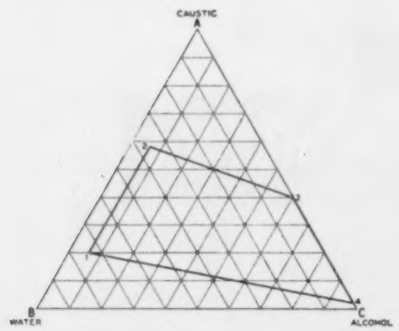
INTRODUCTION: This subject was last treated in the 1957 annual refinery issue of WORLD PETROLEUM. In the intervening eight months, numerous patents have been issued which cannot be classified in more specific categories. Some 40 of these are discussed herein.

The most active area in this field deals with the separation of close boiling and/or isomeric hydrocarbons. The continuing trend of petroleum companies toward the production of chemicals from petroleum is expressed by the large amount of work carried out by many companies on this subject. Another active area is the development of new and improved additives and stabilizers, particularly for the heavier distillate fractions. This probably reflects the increased emphasis on the sale of heavier than gasoline fractions and the greater competitiveness of these hydrocarbons. A number of other subjects such as removal of acidic components and of nonhydrocarbons from petroleum fractions will be treated in less detail.

SEPARATION

A. General: A single-step adsorption process, which permits separation of organic mixtures into at least three components, is described in The Texas Co. Patent 2,818,449—(E. R. Christensen and H. V. Hess). Solid selective adsorbents, such as synthetic zeolites and aluminum silicates, are employed under prescribed conditions of contacting and desorption. Another Texas Co. patent (2,745,790—R. E. Manley) relates to the solvent extraction of liquid petroleum oils containing extract fractions coboiling with the solvent. Extract and raffinate phases are separately distilled. The distillates are condensed and settled with formation of oil-rich, water-rich, and solvent-rich layers. The solvent-rich stream, decanted from the solvent-rich condensate layer, is extracted with a relatively high-molecular-weight paraffin oil.

Stabilization of Cracked Distillate Fuel Oils: USA Patent 2,794,770 to William H. Alderson and Howard I. Allen, June 4, 1957.



B. Diolefins: Several patents disclose methods to purify C_4 and C_5 diolefins. R. W. MacDonald (2,818,457 to Esso Research and Engineering Co.) removes acetylenes from a butadiene stream by repeated extraction with a dilute cuprous ammonium acetate solution. W. S. Colton, P. C. Kupa, and G. W. Taylor in 2,788,378 (to Polymer Corp.) contact the effluent of a C_4 dehydrogenation unit with a small amount of cuprous ammonium acetate solution to remove acetylenes prior to contacting it with the main body of the same solvent to extract diolefins. The separation of isoprene and piperylene from a highly cracked mixture in the C_4—C_{12} range is disclosed in Esso Research and Engineering Co. Patent 2,768,224 (L. B. Page and J. W. Rector). The treatment involves heat soaking to dimerize cyclic diolefins, followed by several closely controlled fractionation steps. W. D. Seyfried in Esso's 2,752,406, describes the separation of acyclic diolefins from gasoline. A cyclic diolefin, (e.g., cyclopentadiene) is added to the gasoline and reacted at 350-450°F to form a coclimer, which is separated by fractionation and can then be depolymerized.

C. Aromatics: Narrow boiling range mixtures of cyclic and acyclic hydrocarbons may be separated by azeotropic distillation in the presence of a completely fluorinated, non-acidic organic compound. (M. R. Cines in 2,789,087 to Phillips Petroleum Co.) Suitable compounds are perfluoro methylcyclohexane or perfluoro-n-heptane. This method permits the separation of cumene from a paraffinic alkylate. I. W. Mills (2,819,326 to Sun Oil Co.) separates aromatics from saturated hydrocarbons in a cyclic adsorption-desorption process. A low boiling, water soluble, highly polar compound, such as acetone is used as the desorbent. V. Haensel (2,799,627 to Universal Oil Products Co.) discusses the separation of aromatic and unsaturated aliphatic compounds. The mixture is contacted with hydrogen in the presence of a platinum-alumina-halogen catalyst. Condensable product is extracted with a selective solvent comprising diethylene—or dipropylene glycol and water.

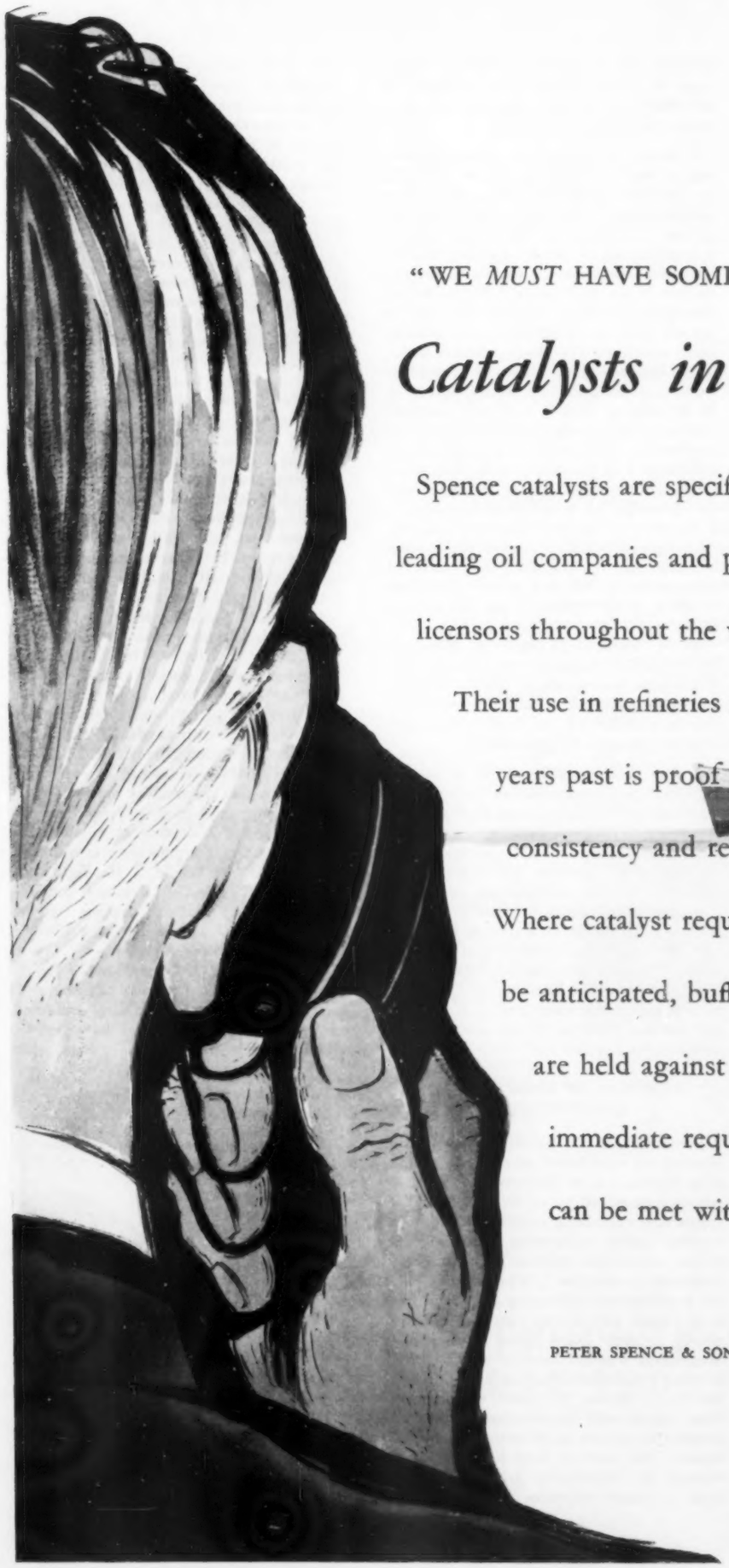
A solvent extraction process for the recovery of aromatics is proposed in R. A. Findlay's 2,806,071 (to Phillips Petroleum Co.). The reflux is a synthetic reflux, which is obtained in a manner and is of a character such, that it does not have to be heated and/or vaporized to recover it from the solvent. A new solvent for the extraction of aromatics from hydrocarbon mixtures is suggested by G. L. Herver and C. B. Linn (2,810,003 to Universal Oil Products Co.) It consists of an aqueous solution of an aryl-desoxyglucitol, which is an alkylate product of a hexose sugar and a monocyclic aromatic hydrocarbon. Extraction is carried out at about 50°C with a solution containing 1-2% of the aryl-desoxyglucitol.

D. Xylenes: One of two Esso Research and Engineering Co. patents, (2,810,773—R. M. Love) describes a procedure to recover a solvent xylene fraction of good acid wash color from a hydroformer product. The other, (2,810,772—R. B. Benett, R. L. Dockendorff, J. M. Powers and R. A. Speed) discloses a crystallization procedure for the separation of p-xylene from an isomer.

Another controlled fractional crystallization process for the separation of xylene isomers is discussed by M. C. Hoff and K. C. Peterson in 2,777,888 (to Standard Oil Co., Indiana).

Two Standard Oil Co., Indiana patents deal with the separation of 1, 3, 5 ethylxylene from C_8 aromatics. N. Stein in 2,803,686, separates 1, 3, 5 ethylxylene and n-xylene by interacting ethylbenzene and at least one xylene isomer other than m-xylene at 100-300°F in the presence of sufficient liquid HF to form a separate acid phase in the presence of at least 1 mole BF_3/mole of xylene. The acid phase is separated in continuous fractionation at a tower pressure of 20-60 psi. D. A. McCaulay and A. P. Lien according to 2,803,687, recover 1, 3, 5-ethylxylene from admixture with ethylbenzene. Ethylene is added to the reaction mixture in the presence of HF and BF_3 at 20-175°C. After removal of the catalyst, the hydrocarbons are distilled to obtain 1, 3, 5 ethylxylene.

The recovery of p-xylene from a crude xylene stock is the subject of M. S. Schlatter's 2,801,271 (to California Research Corp.). The feed is alkylated with isobutene in the presence of HF at 10-100°C. P-xylene remains unchanged, while its isomers are



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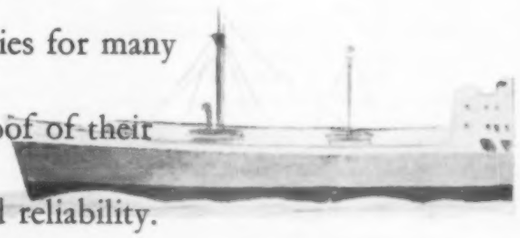

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readily converted to t-butyl derivatives. After fractionation from p-xylene, the t-butyl derivatives are cracked over silica-alumina catalyst at 800-1000°F to recover aromatics and isobutene.

I. Bergsteinson (2,798,104 to Union Oil Co. of California) removes ethylbenzene from its admixture with xylenes by heating the mixture at 50-260°C in the presence of a mineral acid or of an aluminum halide isomerization catalyst and in the added presence of a fused ring aromatic hydrocarbon, such as naphthalene. The ethyl group is transferred to the fused ring hydrocarbon.

E. Miscellaneous: The separation of straight chain olefins from straight chain paraffins of the same boiling range is the subject of Pure Oil Co. patent 2,813,139 (L. R. E. Hutchings). The mixture is hydrohalogenated, contacted with a zeolite, such as calcium-alumino silicate, having a pore size of about 5 A° to selectively adsorb the paraffins. The nonadsorbed hydrohalogenated olefins are dehydrohalogenated.

D. B. Broughton (2,794,839 to Universal Oil Products Co.) discloses a process for separating cyclopentane from C_5 and C_6 hydrocarbon mixture by solvent extraction with a solvent, in which cyclopentane is soluble. The fat solvent is subjected to several distillation steps.

G. C. Ray in a Phillips Petroleum Co. patent (2,801,957) describes the separation of phosphorus halides from their admixture with hydrocarbons by extraction with selective solvents, comprising dialkyl sulfates with no more than 3 C atoms/mole.

ADDITIVES AND STABILIZERS

A. Light Distillates: A series of patents by J. D. Bartleson and assigned to Ethyl Corp. (2,794,713-6; 2,794,718-23) disclose an antiknock additive, comprising organo-lead and a product obtained by reaction between P_2S_5 or P_4S_7 and trihydrocarbon substituted methanes.

A gasoline inhibitor, comprising N-alkyleneoxyalkyl aminophenols is described by E. C. Hughes and S. M. Darling in Standard Oil Co. of Ohio's 2,797,152. The formation of insoluble gums and resins is suppressed. W. W. Scheumann (2,776,194 to Cities Service Research and Development Co.) proposes a gasoline additive to reduce engine deposits and piston ring wear. It consists of a solvent refined light hydrocarbon lubricating oil, benzol, isopropyl alcohol, dimerized linoleic acid, dihexylphenyl amine and amyl nitrate.

Naphthas can be stabilized against corrosion by addition of an organic hydroxy compound, such as beta naphthol in an amount of 0.001-1 wt. % (W. G. Annable, L. E. Hutchings and J. W. Walsh in Pure Oil Co.'s 2,787,531). Another corrosion inhibitor (C. C. Shepherd to Ethyl Corp. 2,798,797) Comprises a partially hydroxylated hydrate of a metallic monobasic acid compound. Kerosine can be rendered color stable and non-fluorescent according to 2,793,986 (W. C. Lanning to Phillips Petroleum Co.). It is treated with hydrogen at 550-625°F and 150-225 psig over a molybdena-silica-alumina catalyst.

B. Middle Distillates: An improved diesel fuel is described by P. L. Pinotti (2,789,892 to California Research Corp.; see accompanying graph). The fuel contains between 0.3 and 3.0 mM/kg of lead in the form of a combination of an oil soluble, organic lead sulfonate and an oil soluble lead naphthenate in a ratio of about 1:30 to 1:1. The synergistic additive combination reduces deposit forming tendencies and reduces wear, associated with the presence of sulfur in the hydrocarbons. According to another California Research Corp. patent (2,794,770; W. H. Alderson and H. I. Allen) thermally or catalytically cracked hydrocarbons, boiling between 300-750°F, are stabilized by treatment with a mixture of alcohol, alkali metal hydroxide and water in proportions falling within the area defined by points 1, 2, 3 and 4 of the accompanying diagram. Reaction products are removed by filtration or water washing. The mixture is employed in amounts of 0.001-0.01 pound equivalent of alkali metal hydroxide per 100 pounds of oil.

W. W. Marshall (2,790,014 to Monsanto Chemical Co.) partially hydrogenates hydrocarbons boiling above 350°C, obtained during the pyrolysis of benzene, and stabilizes them with 0.1-5 wt. % of 9, 10-epoxyoctadecyl diisopropyl phosphite.

C. Fuel Oils: A. Bell and G. R. Lappin (2,805,135 to Eastman Kodak Co.) employ a fuel oil additive comprising an N-oleolyl-N-alkyl α, γ-alkylene diamine in which the alkyl group contains 1-4 C atoms and the alkylene group contains 2-8 C atoms. An additive consisting of dialiphatic-bet- aminopropion aldehydes is disclosed in Armour & Co.'s 2,798,798 (B. E. Marsh, E. N. Schubert, R. L. Betcher and P. L. DuBrow). H. W. Rudel and D. T. Rogers (2,808,320 to Esso Research and Engineering Co.) employ a synergistic combination of lecithin and bavium iso-octyl phenol sulfide as an inhibitor for cracked fuel oils.

REMOVAL OF UNDESIRABLE CONSTITUENTS

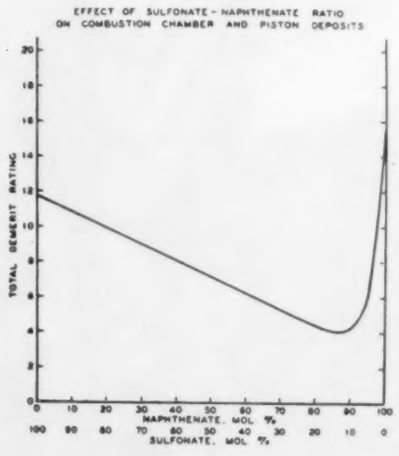
Three Sun Oil Co. patents deal with the removal of naphthenic acids from petroleum fractions. E. M. Honeycutt in 2,795,532 refines mineral oil by contacting its naphthenic acid containing vapors with a liquid treating agent comprising essentially a molten anhydrous mixture of sodium and potassium hydroxides. I. W. Mills in 2,789,-081 percolates a lubricating oil, which has been treated with molten caustic alkali and which contains 1-200 ppm alkali metal compounds through bauxite at 450-550°F to remove the alkali compounds. C. C. Kline and H. L. Myers (2,773,806) treat petroleum vapors with liquid alkali metal hydroxide to remove naphthenic acid in the vapors. The refining zone is periodically cleaned by introducing free naphthenic acids of higher molecular weight into the zone. F. C. Taylor and G. E. Prielipp (2,-797.188 to Dow Chemical Co.) remove acidic constituents from fluids by means of absorbents which comprise alkanolamines. V. Haensel (2,818,323 to Universal Oil Products Co.) purifies an acidic gas stream by contact with a dense, fluidized bed of a dry, solid composite, comprising an adsorptive solid and an amine.

Mercaptans can be removed from a petroleum fraction, according to J. L. Jezl (2,808,365 to Sun Oil Co.) by percolating the fraction along with an epoxide through a bed of solid particles, containing alkali material. The petroleum fraction may also be percolated through this bed in the absence of epoxide. In this case, the alkaline material is periodically regenerated by washing with a hydrocarbon liquid containing epoxide. W. D. Seyfried (2,772,212 to Esso Research and Engineering Co.) pretreats heavy petroleum feed stocks to be hydrodesulfurized. Ash forming and acidic constituents are removed by washing the feed stock with fresh water in a plurality of zones. It is then contacted with an aqueous metal salt of sulfonic acid and an alkali metal salt of an inorganic acid.

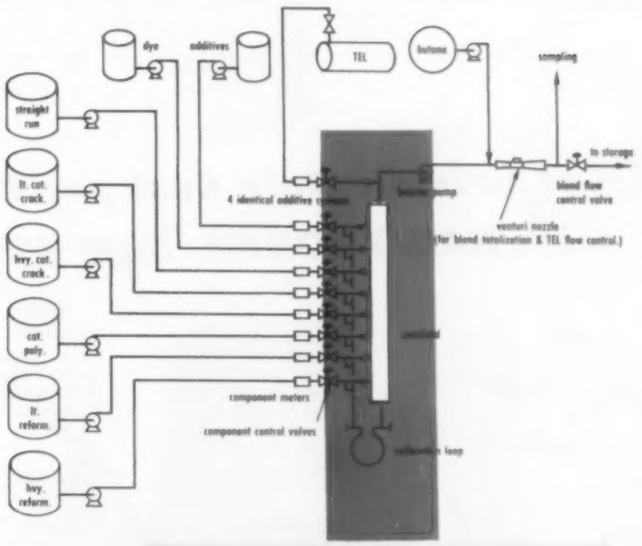
A process for the production of a refined, stable hydrocarbon product is claimed by A. P. Stuart in 2,814,586 (to Sun Oil Co.). Non-hydrocarbon materials are removed from the crude hydrocarbon material by extracting it with BF_3 and simultaneously or subsequently with oxygen. J. I. Slaughter and D. A. McCaulay (2,762,750 to Standard Oil Co. of Indiana) extract polyalkyl benzenes, polynuclear aromatics and sulfur compounds from hydrocarbon oils with a solvent consisting of monofluorophosphoric or difluorophosphoric acid and BF_3. W. I. Gilbert and W. A. Horue (2,816,-905 and 2,816,906 to Gulf Research and Development Co.) claim a process for the deoxygenation of a synthetic crude, derived from CO and hydrogen.

F. A. Apgar (2,778,778 to Sinclair Refining Co.) proposes the removal of suspended, finely divided silica base catalyst entrained in hydrocarbons by contact with caustic alkali of at least 48° Baume. END

Diesel-Fuel Composition: USA Patent 2,789,-892 to P. L. Pinotti, April 23, 1957.



POSITIVE CONTROL OF MATERIALS IN MOTION



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Proportioneers equipment *continuously* proportions and mixes the components . . . in proper ratio to each other and end-product demands . . . and provides safeguards to compensate for any upset. Blender operation, based on the *closed control loop*, constantly meters each stream, compares this signal with an established condition, and automatically makes any flow rate adjustments required.

Keep pace with progress by requesting complete data on this system. Write **Proportioneers, Inc., 481 Harris Avenue, Providence 1, Rhode Island.**

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DIVISION OF
B-I-F INDUSTRIES
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Alaska Active

Colorado Oil & Gas (with Frankfort Oil) has abandoned, at 11,765 ft, their Yakutat A-1, 2nd well on their million acres in Alaska Gulf. Colorado plans to continue drilling after further geophysical evaluation. Both wells have had oil and gas shows.

Canadian companies have filed on a million acres more in lower Kuskokwin River basin—bringing to more than two million acres filed on in the basin since 1st of year. Additional leaseholders include Sunray-Mid-Continent; Snowden interests, of Fort Worth, Texas, and number of individuals.

Instead of continuing development drilling on Swanson River Unit, Socal & Richfield spudded (3/19/58) their Deep Creek Unit well No. 1 on Kenai peninsula—seven miles from Cook Inlet coastline from the town of Ninilchik. Further drilling at Swanson River awaits Interior's decision on wildlife refuge regulations.

After reaming and cementing, Humble-Shell were drilling below 8,900 ft (3/23/58) on their well in Puale-Wide area, Alaska peninsula—where Humble had agreed to drill three wells in exchange for 1/2 Shell's approximate 250,000 acres.

Following have opened offices in Anchorage in anticipation of heavy geophysical work this summer: Socal, Richfield, Shell, Humble, General Petroleum, Union, and Ohio Oil.

Canadian Oil and Gas Law Study

The phenomenal growth of the industry since the discovery of the first well in Leduc, Alberta, in 1947 has led to the development of attorneys who have become specilized in the laws pertaining to oil and gas. The authors of "Canadian Oil and Gas," Lewis and Thompson, are an example of such specialists and to help men in the industry and lawyers generally to appreciate and solve the problems that arise, they decided to produce a text which would serve as a ready source of reference on case law, conveyancing, legislation and other legal matters pertaining to the oil and gas industry.

The book is just finishing its third year of publication. It consists of three volumes and comprises five main divisions.

(A) A concise statement of the law in narrative form with numerous references to cases, statutes and regulations to support the narrative;
(B) A digest of all important cases dealing with oil and gas in Canada;
(C) A set of forms and precedents with explanatory notes as to their use;
(D) A collection of statutes and regulations bearing directly on the oil and gas field; and
(E) An appendix containing comparisons of law, governmental policy letters, etc.

Volume 1 contains the first three Divisions and Volumes 2 and 3 the statutes and regulations for the Dominion Government and all Provinces in Canada, together with the appendix and general index.

There is no doubt but that this text fulfills a need in Canada and can be extremely useful outside of Canada where a knowledge of Canadian petroleum law is important as a reference or from an operational point of view. The book is published by Butterworth & Co. (Canada) Ltd., 1367 Danforth Avenue, Toronto 6, Ontario, Canada, and inquiries respecting the book can be made there.

Cut Seismic Hole Cost per Foot with HAWTHORNE "BLUE DEMONS"

for faster, more efficient drilling in harder formations

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BD-MH — Medium Hard
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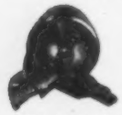
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You can cut your hole cost per foot in seismic drilling by using the RIGHT Bit for your particular formation, because the RIGHT Bit has been engineered to:

- **drill faster . . . giving more footage per hour**
- **last long . . . giving more footage per bit**
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Hawthorne "Blue Demon" Bits are immediately available, in every active exploration area, in the RIGHT formation type, and the RIGHT size to furnish hole size desired . . . and consistently priced RIGHT to give maximum penetration speed and bit life at minimum hole cost per foot.

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Canadian Reserves Higher In 1957

According to Canadian Petroleum Assn., total liquid hydrocarbon reserves in Canada rose to 3.3 billion barrels, up 139.8 million over 1956. Crude reserves at year-end 1957 were 2.9 billion, up 25 million; natural-gas liquids reserves were 395 million, up 115 million. Alberta's crude reserves were down 28 million barrels, while Saskatchewan's were up 62 million. Year-end reserves of natural gas were 19 trillion cubic feet, up 1.7 trillion over 1956.

CANADIAN RESERVES—LIQUID HYDROCARBONS
(Thousands of Barrels)

	12/31/56	12/31/57	Increase
Crude oil	2,849,370	2,874,454	25,084
Natural-gas liquids	279,934	394,660	114,726
Total liquid hydrocarbons	3,129,304	3,269,114	139,810
NATURAL GAS (Millions of Cubic Feet)			
Reserves	18,998,225	20,742,131	1,743,876

10-Year Contract For Alberta Gas

Northern Ontario Natural Gas Co. Ltd. has signed an $8 million contract for delivery to Spruce Falls Power & Paper Co. Ltd. of 18 billion cubic feet of Alberta gas, over 10-year period, to Kapuskasing, Ont.

Pembina Pressure Maintenance

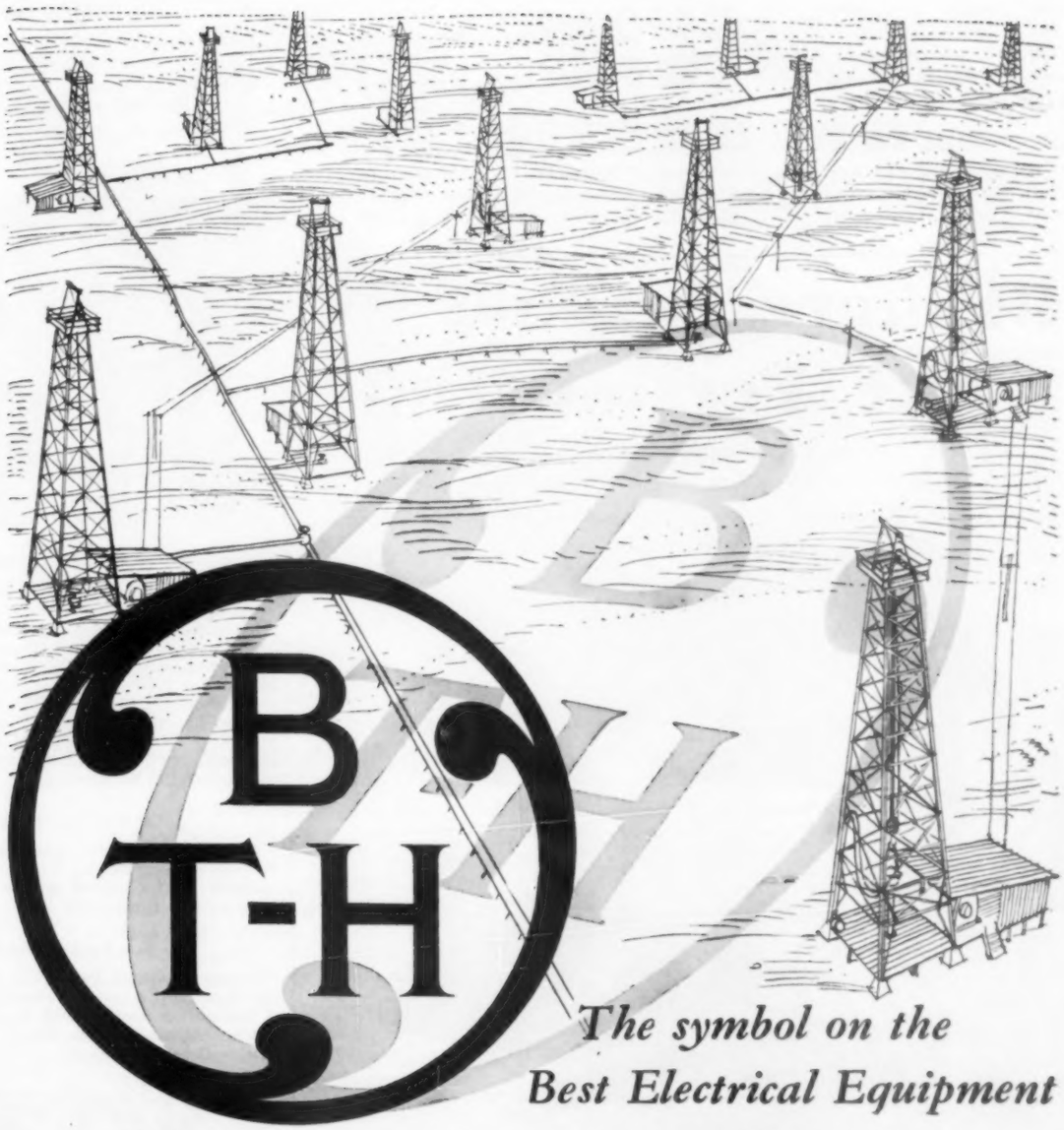
Texaco Exploration Co. plans a major pressure-maintenance program at the large Pembina field which would cost an estimated $3 million and involve 45 injection wells. Formal application has been made by Texaco to the Alberta Oil and Gas Conservation Board for permission to launch the high-pressure water-injection project on approximately 7,200 acres in the Cynthia region of Pembina.

Requests Revised Depletion In Canada

Imperial Oil Ltd. has appealed to Exchequer Court of Canada against federal revenue department's method of calculating depletion allowances. Decision in company's favor could mean millions of dollars to oil companies. Imperial contends the 33⅓% allowance on oil and gas wells should be calculated on individual-well basis as opposed to the present method of making the calculation on the company's entire profits. The present system has been in effect since 1951. Imperial's appeal is based on the federal corporation tax assessment for that year.

1957 Canadian Financial Experience

Typical of financial experience of companies with large exploration and lease commitments, annual report of Triad Oil Co. Ltd. shows net loss of $4.2 million in fiscal 1957, despite 23% increase in crude production. Company participated in 28 wildcats, increased net oil wells to 46, from 28, in year, but finished with accumulated deficit of over $9 million.



B
T-H

The symbol on the
Best Electrical Equipment

Hard and continuous service is demanded of any electrical equipment in the oil industry. That is why in the fields so many of the generators, motors, starters, and other devices bear the initials BTH—symbol of sound design and of guaranteed reliability in service.

But this is only one direction in which the specialisation and long experience of BTH have built up an enviable reputation. It is the same in mining, power supply, traction, marine engineering, and general industry—wherever first-class electrical products are needed. With over fifty-four years' experience and eleven factories, BTH can give outstanding service to industry in every sphere of electrical engineering.

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Natural Gasoline Plant for Steelman Field

(Continued from page 104)

with escalation of ¼¢ per mcf per year. Engineering studies indicate a probable cost of 4.5¢ per mcf for transmission from Steelman to the nearest trunk pipeline.

Gasoline is considered sold at the price of crude oil, and it is estimated that 100% sales are assured.

Propane is considered saleable at 6¢ per Imperial gallon at the plant gate at a rate of 60% of production. Butane is assumed to sell at 2¢ per Imperial gallon at the plant gate at the same rate. Sulfur is considered to sell at $27 per long ton, with 100% sales assumed. The original forecast was for propane production to peak at 97,700 gal per day in 1960, and butane at 59,400 per day in 1960. Gasoline would reach peak production of 37,700 gal per day, and sulfur 26 long tons per day. These figures, for the Steelman area, will be revised upward in the light of current excess producibility over the estimate.

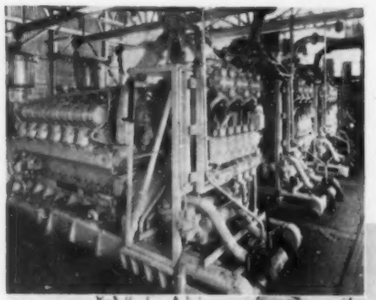
A short report on a preliminary survey of possible salt-bed storage indicates a propane well of 100,000-bbl capacity could be drilled to a salt bed 6,500 ft deep, near the plant location, at a cost of $3.00 per barrel. A well would be drilled to the Viking sand for water supply to wash out a cavity in the salt bed, and a second Viking sand well could be drilled for brine disposal.

At the time this article was prepared, at the end of February, financing arrangements were in progress; but it was not expected that the definitive prospectus would be ready before the end of March. Construction contracts were to be let out to bid during the early part of March—with construction to be completed by next fall.

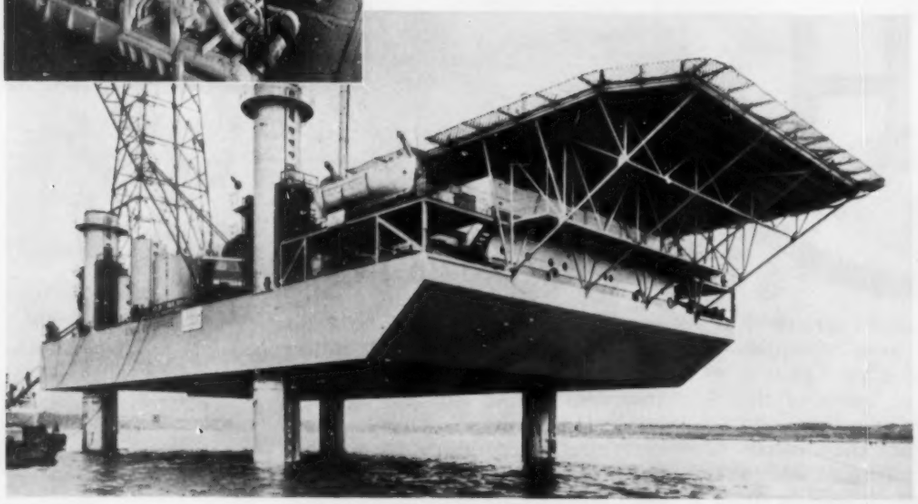
END

for Offshore Drilling in the Persian Gulf

The A.D.M.A. "Enterprise," built by Guttehoffnungshutte Sterkrade A.G. for Abu Dhabi Marine Areas, Ltd., has a National 130 draw-works powered by four Paxman 12RPH 400 s.h.p. Drilpak units (see inset). The drilling equipment was manufactured by Oil Well Engineering Co., Ltd., and is capable of drilling a hole 15,000 feet deep. The 440-volt main electricity supply is obtained from three 220 kw alternators, each driven by a Paxman 12RPH engine.



THE ILLUSTRATION BELOW SHOWS THE "ENTERPRISE" DURING THE TESTING OF THE RETRACTABLE LEGS. (B.P. photograph.)



PAXMAN

DIESEL ENGINES for OILFIELD DUTY

7" BORE RANGE 128 to 800 S.H.P.
9¾" BORE RANGE 400 to 1,750 S.H.P.
Representatives in U.S.A., Beckley, Haltom & Hickman, The Americas Building, Rockefeller Center, 1270 Sixth Avenue, New York 20, N.Y.

DAVEY, PAXMAN & CO., LTD., COLCHESTER, ENGLAND
Associated with Ruston & Hornsby, Ltd., Lincoln
Representatives in Canada:
Edeco (Canada) Ltd., 10103 80th Avenue, Edmonton, Alberta.

J.43

Dual-Flow Control

A parallel dual-flow control, with a minimum of necessary connections, has been developed by the Oil Center Tool Co., Houston. With this control, the operator can switch the flow from one sized choke to another without closing in the well and thus changing any of the well's characteristics.

The company also has developed a dual-tubing hanger, designated the U-65, which allows both strings of tubing to be raised simultaneously at completion or to later kill the well, but with complete control at all times.

GE Control Catalog

General Electric Co. has published *General-Purpose Control Catalog GEC-1260C*, to cover its complete line of control devices. Selection charts cover starters through 200-hp.

To Buy Logging Company

Dresser Industries, Dallas, has offered to acquire The Elgen Corp. through an exchange of stock. Elgen is engaged in electric well logging. Its services would complement those offered by Lane Wells, another Dresser subsidiary.

Views Pipe Double Jointer

French industrial marketing man, Charles Gruere (right) gets a close look at new self-compensating welding head on the Crose-Price-O-Matic pipe double jointer. Mr. Gruere is president and director general of Societe Minière et Commerciale, in Paris, and is the Crose company's exclusive representative in France, Holland, Belgium, French West Africa, Algiers, and the Belgian Congo. Crose export sales manager, John Manley, is at (left) and D. T. O'Connor, export sales representative, is in center.

Upper photo shows erection of T.I.W. Gasoline Storage Tank, 150 ft. diameter x 48 ft. high, 5,292,000 Imperial gallons capacity, for Shell Oil Company of Canada Limited, Montreal.

Toronto Iron Works have specialized in the fabrication and erection of steel tanks for Canada's petroleum industry since 1907. And T.I.W. meets modern requirements in the industry with a modernly equipped plant.

T.I.W. is a leading supplier of a wide range of steel fabricated petroleum processing units . . . pressure and vacuum vessels, catalyst towers, distillation columns, Wiggins vapour-saving equipment.

T.I.W. engineering, production and field-erection teams offer top flight experience for any metals fabrication project.

Lower photo shows the foundation and first course of shell of a 180 ft. diameter x 40 ft. high tank for McColl-Frontenac Oil Company Limited, Montreal, with 6,345,500 Imperial gallons capacity.

T.I.W. STEEL PLATE PRODUCTS CANADA

ESTABLISHED 1907

THE
TORONTO IRON WORKS
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TORONTO-MONTREAL

IN WESTERN CANADA-T.I.W. WESTERN LIMITED, EDMONTON, ALTA.

DESIGNERS • FABRICATORS • ERECTORS

Wear-Resistant Valves

Two high-strength alloy-steel rings which rotate a fraction of a turn each time the gate is opened are the principal feature of the new Type "F" conduit gate valve now being made by Cameron Iron Works Inc., in Houston. This rotating-seat feature is said to increase the life of the Cameron gate valve many times that of conventional valves.

Rotation of the steel seat rings exposes fresh metal to the erosive blast of line fluids during the critical time just as the port in the gate is uncovered on opening, or as the flow is being pinched off on closing. Wear is distributed over the entire sealing surface of the steel seat rings. The valve has been subjected to hundreds of field tests in mud, acidizing, sand fracturing, well-head service, on sweet and sour crude, gas and gas-distillate wells, plus thousands of closely controlled laboratory tests during the development period.

Valve Actuator

A gas- or fluid-operated actuator for plug valves and other 90-deg. rotating mechanisms, called the Robot-arm Valve Actuator, has been developed by the Research Engineering Co., of Houston. The new actuator incorporates a totally enclosed piston rack-and-gear assembly fully submerged in an oil bath. Field installation is simple.

"Mid-Continent" for Unit Rig

Ken W. Davis, president of Mid-Continent Supply Co., and J. L. Vint, president, Unit Rig & Equipment Co., Tulsa, have announced the latter's line of drilling equipment will now be sold by, and carry the name of, Mid-Continent. Purpose is to provide purchasers of UR&E equipment with the extensive service facilities of Mid-Continent in the USA, Canada, and South America.

Officials of Cummins Sales & Service Inc., and Cummins Engine Co. discussed sales plans in Fort Worth recently. Left to right are L. J. Troutz, vice president, Cummins Sales & Service de Venezuela SA; Ken W. Davis, president of Cummins Sales & Service Inc., Fort Worth; J. Irwin Miller, chairman, Cummins Engine Co., Columbus, Ind.; and J. T. Calnon, vice president-sales, Cummins Sales & Service Inc., Fort Worth.

Heads Chemical Sales

David P. Barrett has been named general sales manager, industrial chemicals, by the Davison Chemical Co. division of W. R. Grace & Co. He was formerly general manager, rare earths; and, in his new post, will continue to have responsibility for these products. He succeeds A. R. Worrall, who has become general manager of industrial chemicals.

Clark Centrifugal Catalog

Detailed engineering data and performance characteristics, and a guide to writing specifications, are sections of *Centrifugal Compressor Catalog No. 150* being offered by Clark Bros. Co., of Olean, N. Y. The catalog includes an introduction to centrifugal-compressor features and applications; sections on horizontally and vertically split compressors; and a general section dealing with compressor fundamentals, parts, drivers, engineering data, and specifications. Charts, tables, and equations are offered to aid the engineer.

High-Strength Tubing

Tex-Tube Inc. is producing on a new line-pipe mill a series of high-strength grades and sizes of line pipe which have not heretofore been available. Production consists of 6⅝-in. in weights below 12.89 lb and diameters 4½-in. down through 1-in. pipe sizes in grades X-42, X-46, and X-52.

Miller Heads Crose

Clare G. Miller has been appointed president and T. J. Behrenfeld vice president of M. J. Crose Manufacturing Co. Inc., Tulsa pipeline construction equipment firm. Mr. Miller succeeds D. Michael Curran, who will remain active with the company as consultant. Mr. Miller was vice president of Crose the past three years.

Mr. Behrenfeld joined Crose nine years ago, and has been sales manager for the past two years. Previously, he had opened and managed the Crose Houston division for three years.

C. G. Miller

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Bogota — La Paz — Edmonton
Calgary — London — Ankara — Tehran

ENGINEERS-CONSTRUCTORS
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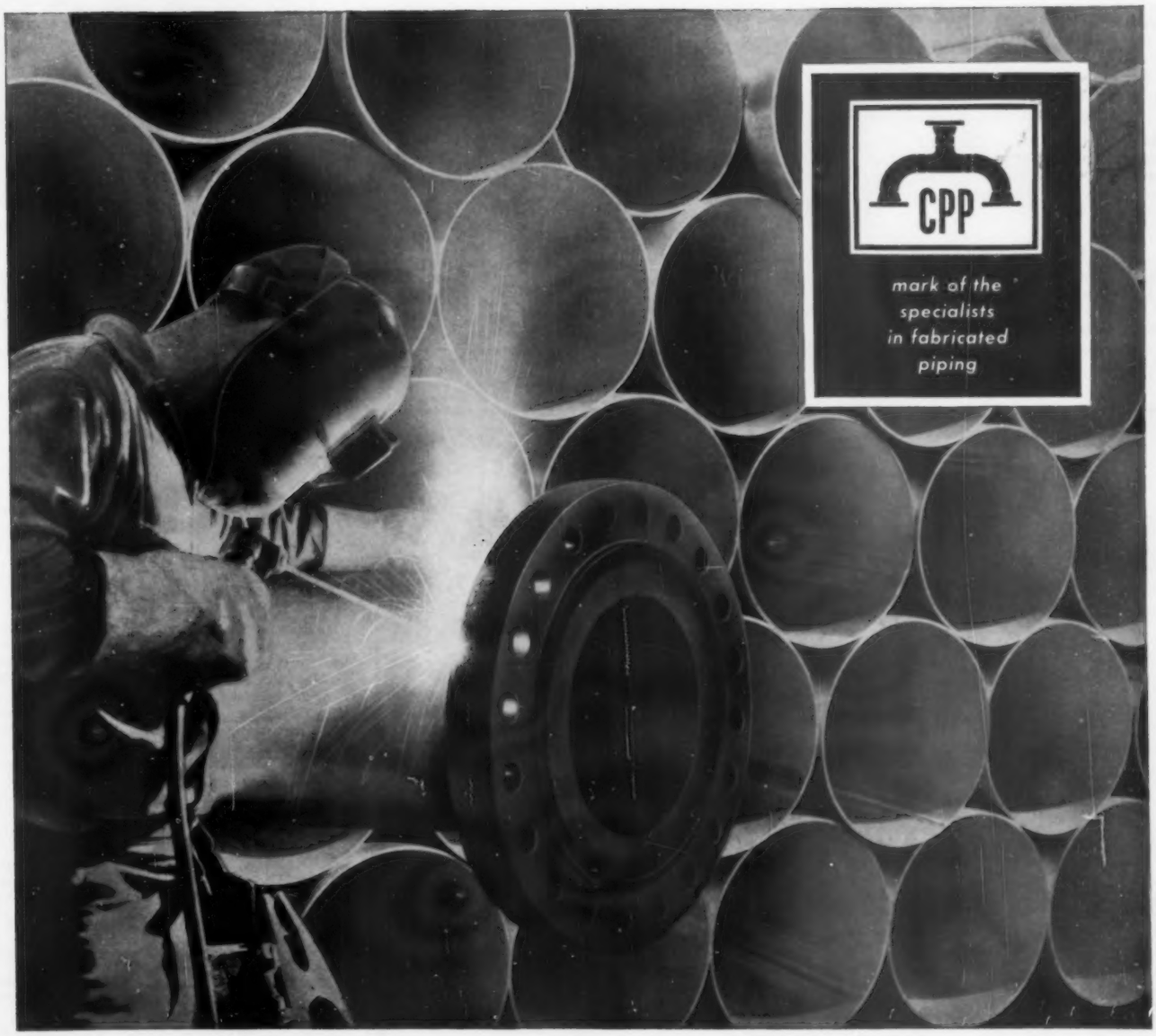

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. . . the two important factors that determine the success of producing fabricated piping

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With material readily available, specialists to do the job and now the most up-to-date fabricating facilities, CPP is unusually well equipped to deliver the piping you need—*on time !*

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SPECIALISTS IN FABRICATED PIPING — CARBON AND ALLOY STEEL

White Motor Names Nave

The White Motor Co. has elected Henry J. Nave, president of The White Motor Co. of Canada Ltd., to executive vice president—with headquarters in Cleveland. Mr. Nave has been with White since 1950. He has been president of White's Canadian affiliate, at Toronto, since 1955.

Distribute W-K-M Products

The Robert Muddiman Co. has been named distributors of W-K-M gate valves and refinery fittings in Canada. The Muddiman company, with offices in Toronto and Montreal, serves the entire eastern part of Canada.

McCullough Michigan Branch

McCullough Tool Co. has opened a service branch at Mt. Pleasant, Mich—with J. L. Booher, service unit operator, formerly at McCullough's Carmi, Ill., branch, in charge of operations.

To Build Fish Dehydrators

Rolo Manufacturing Co., Houston, will manufacture and sell the Fish calcium-chloride gas dehydrator under terms of an agreement reached recently with the Fish Engineering Corp., Houston. Using a series of reflux trays and baffles, the calcium-chloride unit uses brine from the dessicant bed to strip water from the gas stream prior to passing through the specially compounded calcium-chloride pellets. The unit permits unattended operation.

S&T Appointments

Edwin H. Krieg, vice president and consulting engineer of Stone & Webster Engineering Corp., has been elected a director. Since joining Stone & Webster in 1948 as a consulting engineer, Mr. Krieg has worked as a general consultant in various parts of the country.

Wilbur S. Roberts, Jr., of Wellesley, Mass., was named manager of the new business division.

Capital for Oil Companies

The facilities of our organization are available to executives of Canadian and American companies engaged in all phases of the oil and gas industry —exploration, development, pipeline and refining.

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British Industrialists Visit LeBus

L. J. Self, controller for Woodfield Hoist and Associated Industries of Rochester, Kent, England; and R. H. Corbett, sales director, have completed a visit of the LeBus International Engineers Inc. plant at Longview, Texas, where they discussed licensing arrangements for LeBus-engineered spooling with Frank LeBus, Sr., board chairman and Frank Lebus, Jr., president of the well-known Texas concern. Shown in the photograph (left to right) are Fred Erisman, Longview attorney, L. J. Self; F. L. Lebus, Sr.; R. H. Corbett; F. L. Lebus, Jr.

To Exhibit Reformer Model

One exhibit at the USA pavilion at the Worlds' Fair at Brussels will be scale model of a Kellogg catalytic reforming unit. The model is assembled of performed plastic parts of the type now being used by M. W. Kellogg Co. as an aid in plant layout and design.

Security International

Security International CA has been appointed worldwide sales representative (outside the United States and Canada) for Security Engineering. Western hemisphere office is at Apartado 4880, Correos Del Este, Caracas. South American manager is S. C. Welker; eastern Venezuela district manager is A. R. Patton; and western Venezuela district manager is B. A. Barker. Eastern Hemisphere office is at English Steel Corp., St. Ermins-Caxton Street, London SW-1, England. Sales manager is Harold Hall; assistant manager is Peter L. Winter.

Kellogg Engineering

The M. W. Kellogg Co., New York, has appointed J. A. Crowley as manager of administrative engineering. Mr. Crowley was formerly manager of systems at Kellogg.

Cummins Appointment in Venezuela

Leo J. Troutz has been appointed vice president of Cummins Sales & Service de Venezuela, CA. This company distributes and services Cummins diesel and turbodiesel engines in Venezuela. General offices are in Caracas, and maintenance shops and sales points in Caracas, Maracaibo, and Anaco. Mr. Troutz will continue as general service manager of Cummins Sales & Service Inc., Fort Worth, and divide his time between the two organizations.

L. J. Troutz

Why AMERICAN IRON Drill Collars Last Longer ...Increase Drill String Efficiency!

Exacting Metallurgical Control

Our metallurgists check and accept from the mill only those bars of uniform micro-structure which meet the high specifications for American Iron PREMIUM drill collar steel!

Advanced Manufacturing Techniques

Precision machining of outside drill collar diameter and micro-accurate "coring" produce a uniform end-to-end wall thickness. Precision threaded connections are microized to prevent sticking and galling.

Quality Product Reputation

With the finest record of drill collar performance in the field today . . . both Domestic and Export . . . American Iron is consistently first in the manufacture of premium steel drill collars.

PRECISION MACHINING of outside drill collar diameter and micro-accurate "coring" produce a *uniform wall thickness* end-to-end, minimizing the possibility of bending or kinking in the hole. This *balance* in American Iron drill collars is a safeguard against unnecessary drill string vibration! Over-all heat-treating of each bar assures a uniform micro-structure throughout the body of the drill collar—*for highest tensile and impact strength!*

To get more footage drilled with less drill collar trouble—specify American Iron Premium Steel Drill Collars!

AVAILABLE THROUGH YOUR LOCAL SUPPLY STORE

Another AMF Product
PETROLEUM EQUIPMENT

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518 North Indiana Avenue • Oklahoma City, Oklahoma
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

Joins T. I. Board

Dr. Lloyd V. Berkner has been elected director of Texas Instruments Inc. Dr. Berkner is president of Associated Universities Inc., New York, an educational institution sponsored by nine leading universities of the Northeast to establish and operate very large research facilities which provide the academic community with access to the most sophisticated and advanced research devices. Among its activities are the Atomic Energy Commission's Brookhaven National Laboratory and the National Radio Astronomy Observatory.

Supervisory Controls Bulletin

General Electric Co. has published *Bulletin GET-2738* to give detailed information on the description, operation, and application of supervisory control equipment. It describes equipment used for master and remote pumping stations.

Heads Selas Research

C. Glen Bigelow, Jr., has been appointed director of research for Sales Corp. of America, Dresher, Pa. He comes to Selas from American Machine and Foundry Co.

Gardner-Denver Appointment

Robert L. Williams has been appointed advertising manager of Gardner-Denver Co., Quincy, Ill. He was formerly assistant advertising manager for the company's industrial products division.

Aluminum Chemicals

A basic handbook on industrial applications of aluminum chemicals has been published by Reynolds Metals Co., Louisville, Ky. It summerizes the technology of present applications and suggests new uses.

With Canadian production supplying 60 percent of our present oil consumption and with the coming advent of gas into the important Eastern markets, this constantly expanding industry is expected to play an increasing role in the economy.

We shall be pleased to discuss, with companies desiring additional capital, means of obtaining funds for their particular needs.

DOMINION SECURITIES CORPN. LIMITED

Established 1901

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Cooper Promotes Harry Kramp

Harry R. Kramp, with Fred E. Cooper Inc. for the past 24 years, has been appointed vice president and assistant general manager. During his service, Cooper line has been expanded to over 40 models, as compared with the four models in production in 1934.

Joins Chemical Construction

Ira S. Boydston has been appointed manager of a new Gulf Coast office for Chemical Construction Co., at Houston. He formerly was sales manager for Petreco. Mr. Boydston will specialize in helping refiners solve their problems in air and water pollution, and in petrochemical planning.

Approve Husky Offer

Shareholders of Liberal Petroleums Ltd. have approved offer of Canadian Husky Oil Ltd. to purchase Liberal's assets. Liberal's shareholders voted in favor of accepting Canadian Husky's offer and liquidation of Liberal.

pH Equipment

Beckman/Process Instruments Division, Fullerton, Calif., has published *Bulletin 5400: "Beckman Industrial pH Equipment,"* which gives detailed descriptions and specifications for all Beckman industrial pH instruments, electrodes, and accessories.

The brochure is profusely illustrated with photographs and detailed drawings. Copies are available free of charge from Beckman/Process Instruments Division, Fullerton, Calif.

New Cladding Materials

Lukens Steel Co. has successfully rolled clad plate with Hastelloy B, Hastelloy F, Hastelloy C, and titanium. Inquiries, on an experimental-order basis, are being invited. Samples were displayed for the first time at the recent annual convention of the National Assn. of Corrosion Engineers, in San Francisco.

Flange-Dimension Standard

Oil Center Tool Co. has published a 15-page *Flange-Dimension Reference Book*, based on tentative API Standard 6 B, fifth edition. Copies may be obtained from company representatives or by writing to Oil Center Tool Co., P. O. Box 3091, Houston, Texas.

Experimental Tanker for LPG

Sir Harold Smith, chairman of British Gas Council, announced in London recently that a jointly owned company had been organized by the council and Constock Liquid Methane Corp. The latter is owned 50% by Continental Oil Co. and 50% by Chicago Stockyards Co., of Chicago. The new company is now constructing an experimental tanker for the purpose of delivering methane gas in liquefied form to Great Britain.

"Vokes 'Top Servicing' lubricating oil filter makes life a lot easier!"

'Top Servicing' is yet another Vokes development. It cuts maintenance time to a minimum — saves man hours and money. You simply unscrew the clamp ring, remove the cover plate and inner seal, and withdraw the filter element. The clamp ring may be locked in any radial position, a particularly useful feature in confined spaces. 'Top Servicing' is typical of Vokes practical approach to filter problems. If you have a filtration problem please contact our engineers. They will be glad to help you.

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V 277

Oil Company Staff Changes

Dr. ALEX LEWIS, Jr. has been promoted to manager, petrochemicals department (effective April 1) of Gulf Oil Corp. He previously was in charge of chemical marketing for the petrochemicals department, and will succeed L. O. Crockett who was recently elected president of Goodrich-Gulf Chemicals Inc. in Cleveland. Dr. Lewis' headquarters will continue to be in the Gulf Building, Pittsburgh.

M. A. WRIGHT, coordinator of worldwide producing activities, has been designated a candidate for election to the board of directors of Standard Oil Co. (N. J.), at the company's annual meeting, May 28. This will increase the number of directors to 15 from 14.

R. C. FREDERICK has been appointed coordinator for gas and gas liquids by Gulf Oil Corp. Mr. Frederick has had 25 years of experience in this particular phase of the oil industry.

J. A. WARKE has been appointed assistant coordinator of joint operations of Mobil Oil of Canada, at Calgary. Succeeding him as district operations superintendent in Calgary will be A. A. Halkers. S. M. Thorne has been named district operations superintendent in Edmonton.

Mr. Warke commenced his career in oil almost 30 years ago, in Turner Valley. From 1947 to 1952 he was engaged in Persian Gulf production. He came to Mobil Oil of Canada in 1952, and has been a district superintendent in both Edmonton and Calgary.

Mr. Thorne joined Mobil Oil of Canada in 1952. Mr. Halkers has had experience in the oil fields of Indonesia and New Guinea.

FRANK J. DOSTALER has been appointed manager of International Petroleum's marketing operations in Peru. He joined Imperial Oil Ltd. in 1935, and has worked continuously for International in South America since 1937—holding various assignments in Ecuador, Colombia, and Peru. Mr Dostaler assumes the position formerly occupied by Orville W. Johnson, who is retiring after 31 years, service.

FRANK J. ORTT, formerly with Sun Oil Co. at Calgary, Alberta, has joined the Tretolite Corp. as representative at Estevan, Saskatchewan.

THOMAS W. CAFFEY, Tulsa, Okla., attorney, has been named general attorney for Pan American International Oil Co., Eastern Hemisphere subsidiary of Pan American Petroleum Corp. His headquarters will be in New York. A native of Pittsburg, Kans., Mr. Caffey has handled the legal aspects of Pan American's (formerly Stanolind's) foreign operations in Canada, Cuba, and Venezuela since their inception.

C. A. ('Cal') CALLAHAN has been elected president of the Pipe Line Contractors Assn. of Canada at that association's recent fourth annual convention in Victoria, B.C.-C.A. He takes over the presidency from R. K. Banister of Edmonton at a time when the industry faces its biggest year and some of its most serious problems. The new president was graduated by the University of Kansas, with a B.Sc. in civil engineering. He has been in the construction end of the pipeline business throughout his career, and has ranged the world on pipeline jobs—covering projects in Panama, South America, the Middle East, and the United States.

P. C. Spencer

E. L. Steiniger

P. C. SPENCER, president of Sinclair Oil Corp. since 1949, has been elected board chairman and chairman of the executive committee—succeeding M. L. Gosney, retired after 41 years' service. Mr. Spencer will continue as chief executive officer. **E. L. STEINIGER**, formerly executive vice president-operations, succeeds Mr. Spencer as president

Mr. Spencer joined Sinclair in 1934 in the legal department. He has served in various capacities. He succeeded H. F. Sinclair, founder of the company, as president in 1949. Mr. Steiniger joined Sinclair in 1925, and worked in the company's headquarters until 1928—when he transferred to Venezuela, where he spent the next 25 years. In 1936, he was elected a director of Venezuelan Petroleum Co. —now known as Sinclair Venezuelan Oil Co., 96.24% owned by Sinclair Oil Corp. In 1950 he was made president of that company. He was elected vice president of the parent corporation in 1955, in charge of foreign operations, and was named executive vice president in charge of all operations in 1957.

D. B. VALE, OBE; P. L. Kartzke; and G. Davidson have been elected directors of Shell Oil Co. of Canada Ltd., at Toronto. All three hold executive positions with the company—Mr. Vale as executive vice president; Mr. Kartzke, vice president for exploration and production, and Mr. Davidson, vice president, manufacturing.

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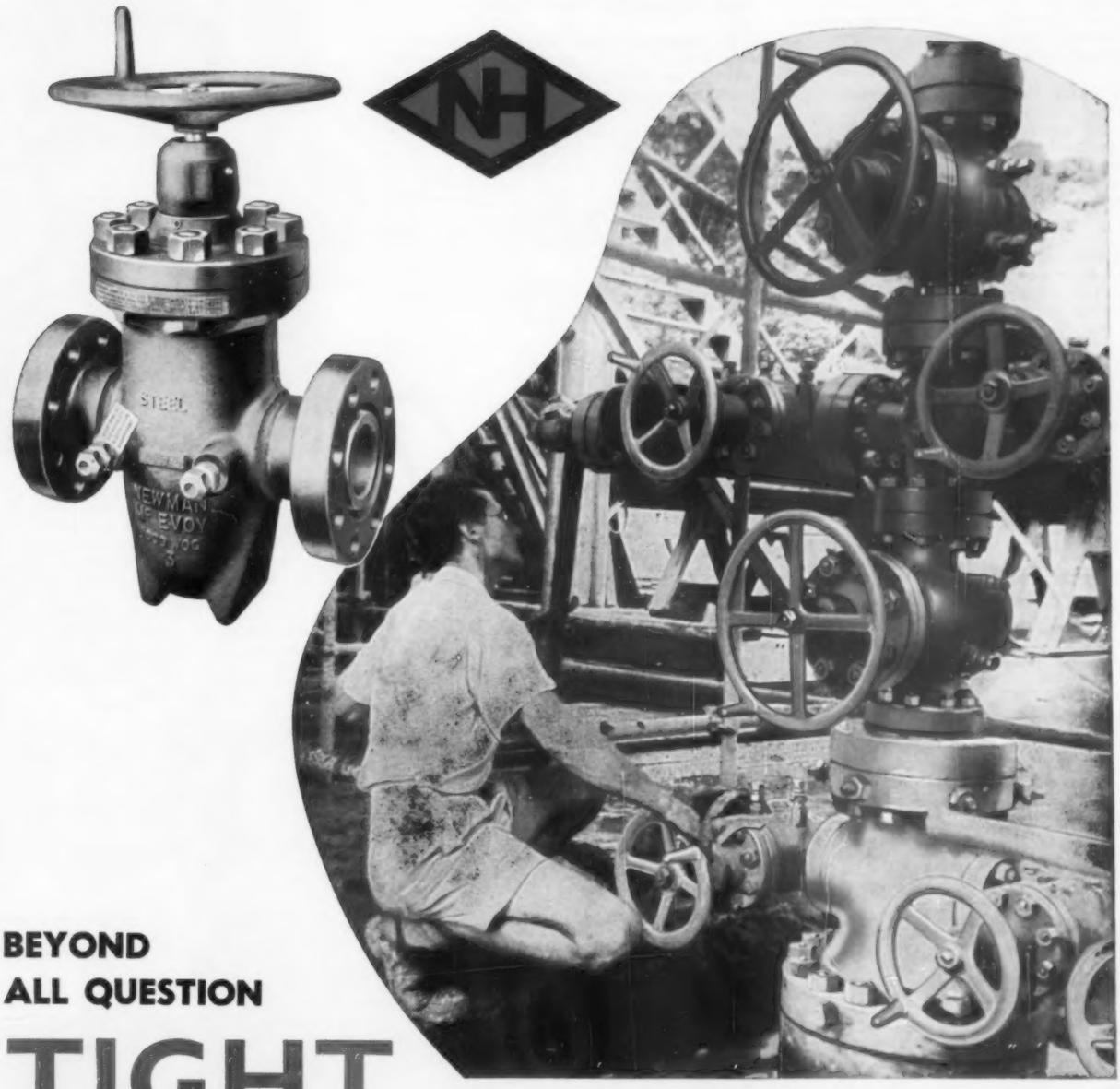

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MURRAY E. BODY has been appointed general manager of Tidewater Oil Co.'s operations in Turkey, according to J. Earle Gray, head of foreign exploration and production. Mr. Body succeeds Martin H. Mitchell, who is returning to San Francisco to become assistant to Mr. Gray.

W. RAY STAPLES, Dallas petroleum consultant, has been named president of Georesearch Inc., an oil company with headquarters in the Vaughn Bldg., Dallas. Mr. Staples has been active in the oil and gas consulting field for a number of years, and has had wide experience in oil-property evaluation and operation—with particular emphasis on secondary recovery.

JOHN W. CLARK, assistant manager of exploration for Magnolia Petroleum Co., has been elected a director and vice president. He will continue to direct exploration activities.

PAUL L. WAID has been named assistant superintendent of operations of Loffland Bros. Co. of Canada, with headquarters in Calgary.

N. F. GREBELDINGER has been appointed to newly created position of director of marketing operations for British American Oil Co. Ltd., with headquarters in Toronto.

R. D. MAGEL has been appointed national supervisor of representation for British American Oil Co., headquarters in Toronto. B-A also has announced appointment of S. C. M. Ambler to the newly created position of product-line coordinator, with headquarters in Toronto. Mr. Ambler formerly was national supervisor of industrial and transportation sales.

HERBERT H. LANK has been elected a director of Hudson's Bay Oil and Gas Co. Ltd.

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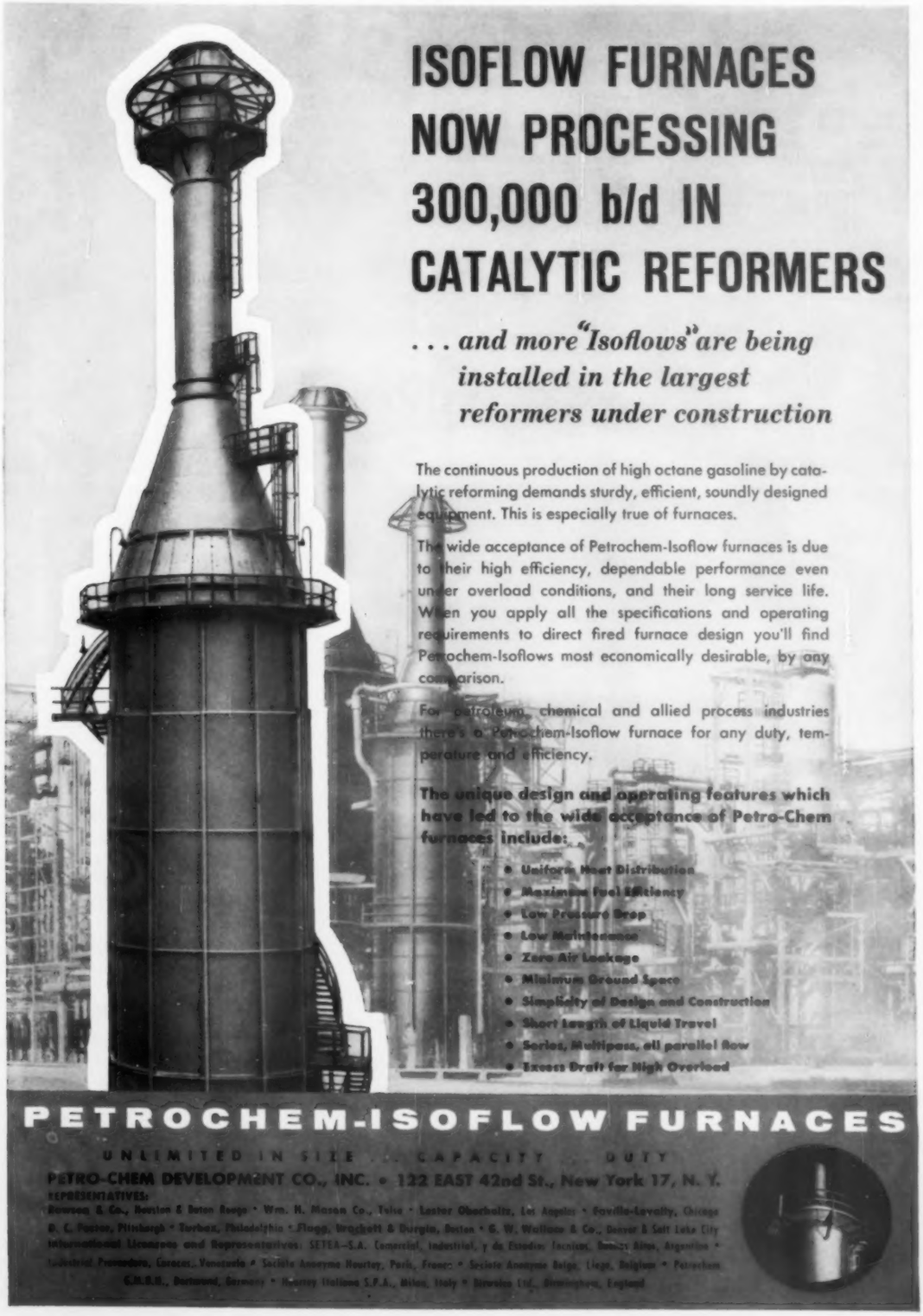
BEN F. UHL, Jr., has been appointed president of Conorada Petroleum Corp., New York. W. F. Penniman, Jr., has been named vice president in charge of government relations and negotiations; and C. G. Flittie, vice president in charge of exploration.

Mr. Uhl was with US Bureau of Mines before joining Conorada in 1954; in 1955 he became vice president. Mr. Penniman, presently stationed in Paris, France, has been associated with Conorada since 1953, and previously was with the Department of State. Mr. Flittie, previously associated with Arabian American Oil Co., Dhahran, Saudi Arabia, joined Conorada in 1957.

E. C. BABSON, Union Oil Co. of California, has been elected chairman of Alberta Board of Directors, Canadian Petroleum Assn. Also elected for a 12-month period were Dr. W. C. Howells, McColl Frontenac Oil Co. Ltd., 1st vice chairman; and J. B. Webb, Canadian Oil Companies Ltd., 2nd vice chairman. The new chairman and first vice chairman automatically become members of CPA's Board of Governors.

D. B. VALE, formerly assistant to executive vice president, Shell Oil Co., New York, has been appointed vice president, of Shell Oil of Canada Ltd., Toronto.

HARRY W. HOWZE has been elected a vice president and manager of aviation sales by Esso Export Corp., international marketing affiliate of Standard Oil Co. (New Jersey). Formerly president and director of Esso Standard (Near East) Inc., Mr. Howze began his career with the Jersey organization in 1930.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G.M.B.H., Dortmund, Germany • Nuovo Italiana S.P.A., Milan, Italy • Stevens Ltd., Birmingham, England

ARTHUR R. SMITH, Conservative Party member of parliament for Calgary South, has resigned his post with Pacific Petroleums Ltd., Calgary, to retain a free hand in speaking for the industry. Mr. Smith accepted the position as executive assistant to Pacific last July shortly after the general election.

GORDON W. LADE has joined Richfield Oil Corp., and will act as solicitor for the Canadian division. Previously he served in the legal department of Mobil Oil of Canada. His headquarters will be in Calgary.

BURL S. WATSON, president of Cities Service Co., has been appointed chairman of the Petroleum Division of the New York City Cancer Committee's 1958 April Cancer Crusade. Appointment was announced by John Reed Kilpatrick, president and chairman of the board of the committee.

JAMES S. CLARK of Cranford, N. J., and Harry F. Moore of Mountainside, N. J., have been appointed senior engineering associates of Esso Research and Engineering Co., scientific affiliate of Standard Oil Co. (N.J.).

T. F. PALMER, assistant division manager of the Houston division of Sinclair Oil & Gas Co., has been elected a vice president of the company and named Houston division manager.

Mr. Palmer succeeds G. D. Almen Jr., vice president, transferred to Midland, Texas, as Midland division manager.

G. VERNON HURST has assumed responsibilities of tax man in Sun Oil Co.'s Canadian production division. He succeeds Dudley M. McGeer, who has transferred to Toronto to handle tax matters for Sun Oil Co. Ltd., operating in Eastern Canada.

GEORGE F. HORNADAY has been appointed manager of research and development department, Houdry Process Corp., Philadelphia, Pa. He heads operations at the Linwood, Pa., research and development laboratories. Before joining Houdry in 1940, he had been with Socony Vacuum. His experience includes catalytic cracker operation, reactor design, technical service, and participation in development of Houdry's dehydrogenation process used for production of butadiene and butenes.

DANIEL L. HUSSEY has been appointed deputy manager of the new refinery now being built in Cologne, West Germany, by Esso AG, Standard Oil Co. (New Jersey) affiliate. He was formerly general superintendent of Esso's Bayway, N. J., refinery, and more recently general manager of the Abadan refinery in Iran. In 1949, he accepted an overseas assignment with another SONJ affiliate, as process superintendent of the Aruba refinery, NWI. He returned to the Bayway refinery in 1951.

R. E. CLARKE has been elected president of Pacific Oil Co. (California), a wholly owned subsidiary of Standard Oil Co. of California, with headquarters in San Francisco—succeeding T. J. Galbraith, retired. In addition to his new job, Mr. Clarke will continue as manager of natural-gas unilization. Pacific Oil owns shale-oil lands in Colorado.

FRED F. FLORENCE, president and chief executive officer of Republic National Bank, has been elected chairman of the board of Lone Star Steel Co., Dallas, Texas.

WILLIAM E. McTURK has been appointed assistant director, public-relations division, Esso Research and Engineering Co.—central scientific affiliate of Standard Oil Co. (N.J.)—at Linden, N. J.

KERMIT ROOSEVELT has been appointed director of governmental relations for Gulf Oil Corp.—with offices in Washington, D. C. In this newly created position, he will maintain liaison between Gulf and US government agencies and other countries with which company does business.

Grandson of the late President Theodore Roosevelt, and son of the late Kermit Roosevelt, Gulf's Mr. Roosevelt has been a consultant to various government departments—most notably to the Secretary of State concerning Middle East affairs.

JAMES M. PATTERSON has been appointed director of public relations for American Oil Co., New York, effective April 16. He had been serving as director of Standard of Indiana's (parent company) public-relations department—his duties including coordination of these activities in 15 Midwestern states.

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RUSSELL H. GREEN has been elected president of Signal Oil & Gas Co., Los Angeles, Calif. S. B. Mosher has been elected chairman and chief executive officer.

WILLIAM E. WALKUP, since 1955 director in charge of finance, has been elected vice president. **ALBION E. STEBBINGS**, formerly assistant secretary, has been named secretary.

Dr. LAWRENCE A. KIMPTON and F. Cushing Smith have been elected directors of Standard Oil Co. (Indiana), Chicago, Ill. Dr. Kimpton, chancellor of the University of Chicago, replaces the late Judson F. Stone. Mr. Smith, general manager of the company's supply and transportation department, replaces Dr. Robert E. Wilson, retired as of March 19 at age 65.

Mr Stone, manager of McCormick Estates and a director of Indiana Standard since 1937, died February 20.

JOHN E. ROUSE, Denver, has been elected president of Utah Southern Oil Co. He succeeds George T. Hansen, Salt Lake City, who founded the company in 1921 and has since served as its president and now becomes chairman. George T. Hansen, Jr., Salt Lake City, was named vice president in charge of operations.

Mr. Rouse retired in 1953 after serving for more than 30 years with the Standard Oil Co. of Indiana interests, his last position being as vice president in charge of operations for Stanolind Oil & Gas Co., its producing subsidiary.

PHILIP L. McLAUGHLIN, petroleum engineer, has opened consulting offices, in the Exchange Bank Building, Dallas. He will specialize in market research for equipment suppliers and as a drilling consultant for contractors. Mr. McLaughlin has been a contributor to *World Petroleum* on drilling subjects.

IRVING C. ANDERSON has been appointed head of the export sales department of Creole Petroleum Corp., a USA company operating in Venezuela, one of the world's largest producers of oil. He succeeds John W. Miller, resigned—formerly assistant manager of the department, a post he held since 1953. Succeeding Mr. Miller as assistant manager is James Harkins, who had been in charge of the department's sales development section.

P. A. ROBERTSON, division economics geologist of Gulf Oil Corp., Houston production division, has been transferred to Bahamas Gulf Oil Co. in Nassau, with title of special representative. He will have charge of all of Gulf's exploration and production activities in the Bahamas.

Mr. Robertson started with Mexican Gulf Oil Co. in 1920. He has been with the Houston division as geologist since 1929.

CODY R. SPENCER has been appointed president of Kroy Oils Ltd., Calgary, succeeding John A. Hext. Mr. Spencer also is president of General Petroleums of Canada Ltd., New Superior Oils of Canada Ltd., Altex Oils Ltd., and serves as a director of Edmonton Pipe Line Co. Ltd.

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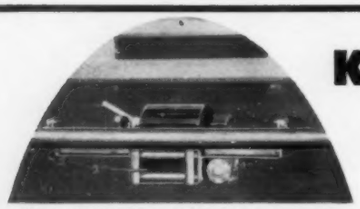
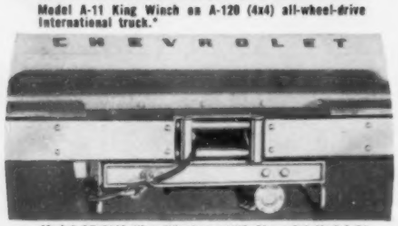
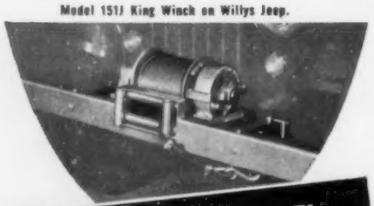


Model A-11 King Winch on A-120 (4x4) all-wheel-drive International truck.*



Model CD-8116 King Winch on 1958 Chevrolet Model 31 (4x4).

Model 151J King Winch on Willys Jeep.



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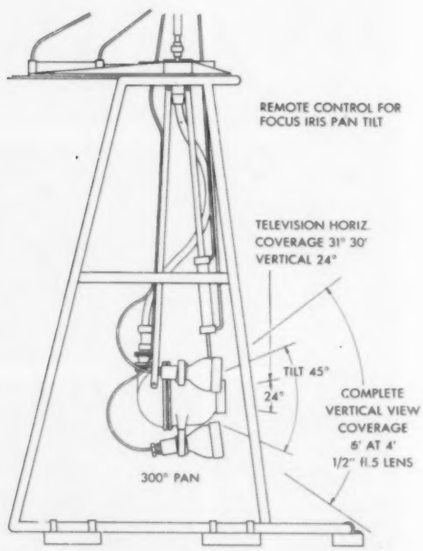
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The TV unit minimizes the need for divers. When a diver is used, his actions can be observed and directed by an experienced driller stationed at the monitor. The normal limit of depth to which a diver can go is 200 ft, whereas the TV camera can be used effectively at 1,000 ft. Similarly, the TV camera, as a result of contrast control, has an effective vision or perception approximately twice that of a normal diver's eyes. It provides a means for technically qualified personnel to observe and direct under-water operations on a round-the-clock schedule.

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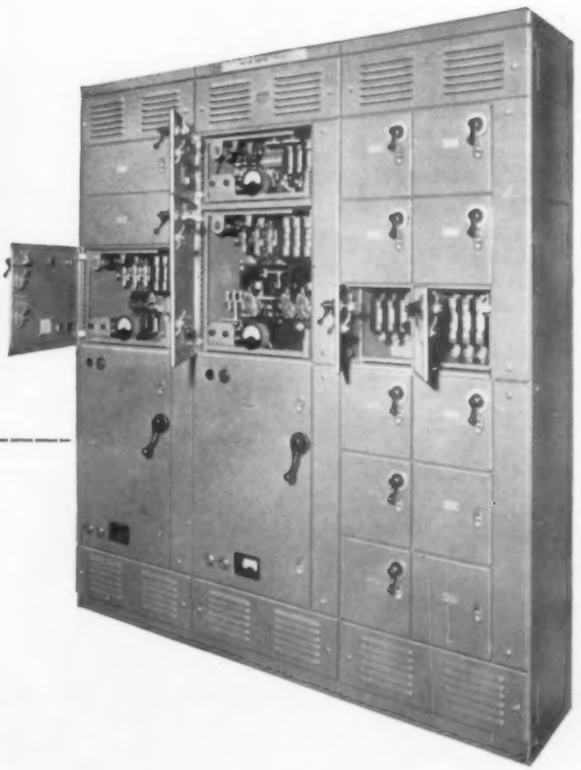

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Foreign Monthlies Change Names

Names of two Library of Congress monthly publications, which serve as keys to new literature coming into this country from the USSR and East Europe, will be changed from "Lists" to "Indexes." The *Monthly List of Russian Accessions*, which enters its 11th year of publication in April 1958, becomes the *Monthly Index of Russian Accessions*. The Government Printing Office sells it for $12 a year ($15 abroad). The *East European Accessions List*, published since 1951, becomes the *East European Accessions Index*. The GPO sells it for $10 a year ($12.50 abroad). Change in the names of the two bibliographies does not mean a change in the editorial content of either. They contain information *about* the content of books and articles, *not* translations of entire books and articles.

Robert E. Wilson Honored

Standard Oil Foundation Inc. (Indiana) has made a $75,000 gift to the College of Wooster, Wooster, Ohio, as testimonial to Dr. Robert E. Wilson, Wooster graduate and chairman of the college board of trustees. Grant was made on the occasion of Dr. Wilson's retirement both as chairman of the foundation and as board chairman and chief executive officer of Standard Oil Co. (Indiana). Frank O. Prior, president of the foundation and of Indiana Standard, announced the gift at a dinner given by the company's board in honor of Dr. Wilson.

Gulf Platformer for 100-ON Gas

Gulf Oil Corp. has placed a new 26,000 b/d Platforming unit onstream at its Philadelphia refinery —second of this type at the Philadelphia location. The first has a capacity of 16,000 b/d. Both units were designed by Universal Oil Products Co. and erected by Procon Inc., of Des Plaines, Ill. Products from the reformer will primarily be used to further improve automotive gasolines—100 octane and above.

Gulf Cited for Education

Who's Who in America has awarded Gulf Oil Corp. an honorable mention for exceptional corporate educational philanthropy as exemplified by Gulf's aid to education program. Awards are given biennially in recognition of the most significant corporate gifts which further the American educational system.

Dresser Reports First Quarter

Dresser Industries Inc., Dallas-based manufacturer of equipment and supplier of technical services to the oil, gas, and chemical industries, has reported first quarter 1958 sales of $58,406,000. Net earnings were $3,135,000, and earnings per share were $0.70. Sales for the comparable period of 1957 were $63,171,000, with net earnings of $4,532,000 and earnings per share of $1.01. Lower 1958 earnings in the first quarter were credited primarily to a temporary lull of activity in the domestic oil industry in the areas of exploration, drilling, and production.

1957 Rocky Mountain Survey

The 28th *Annual Resume of Rocky Mountain Oil and Gas Activity (1957)* has been published by Petroleum Information, and is available at $10 per copy from P. O. Box 2612, Denver, Colo.

Husky Subsidiary Renamed

Glenn E. Nielson, president of Husky Oil Co., has announced the company's wholly owned light-ends marketing subsidiary, H. Earl Clack Inc., has been renamed and expanded to include Husky's refining operations and the marketing of asphalts and other heavy-end products. Mr. Nielson said that the subsidiary's name has been changed to Husky Hi-Power Inc., and that refinery operations, heavy-ends marketing, and related service functions have been placed under its direction.

Sun Adds Research Facilities

A new wing to Sun Oil Co.'s production research and development laboratory, at Richardson, Texas, has been completed, and members of the staff have moved in.

New research to be carried on here includes porous model studies, in which actual porous reservoir models will be constructed; and a lab for X-ray diffraction, a new tool for reconstructing geological history.

Ethyl's New Plastics Unit

Ethyl's Corp.'s newly completed vinyl chloride monomer plant at Baton Rouge, La., is now in operation. Plant is the first in Louisiana to produce vinyl chloride monomer in commercial quantities. Vinyl chloride monomer is an intermediate product in the manufacture of polyvinyl chloride, which in turn is one of the major plastics in use today.

To Explore Gran Chaco

Three-axle drive oil-field trucks have been especially designed by Autocar for use by Pure Oil Co. in exploring the Gran Chaco in northern Paraguay, where Pure has a 23,200-square-mile oil exploration concession. Before drilling can start, Pure must build 150 miles of jungle road to the first drill site, 350 miles north of Asuncion.

Two preliminary wells are to be started in 1958.

Shell Transport Offer Oversubscribed

Shell Transport & Trading Co. Ltd. has announced acceptances to its recent stock offer totaling approximately 7,940,000 ordinary shares of £1 each (including New York shares), about 98%. Applications for additional shares were received from more than 75,000 shareholders for a total in excess of 5,250,000 shares.

Where "Gas" Prices Come From

Shell Oil Co. has published a book on gasoline prices called *Old MacDriver Had a Car*. Written by John Earl Davis, editor of *Shell Progress*, it tells service-station dealers and their customers just where gasoline prices come from. The book's four chapters are titled: "Your Money's Worth At The Pump," "How Retail Prices are Born," "How About Price Wars," and "The Story Behind The Tank Wagon."

California Oronite Formed

A new company, California Chemical International Inc., has been formed, and has begun operations, to take over the expanding export market of Oronite Chemical Co. Like its sister, Oronite, the new firm will be a subsidiary of Standard Oil Co. of California. It will have executive offices in San Francisco and branch offices in Geneva and Panama City. President of the new company is T. G. Hughes.

Prospect of oil

In the search for oil, no corner of the wilderness escapes today's exploration teams. Their work contributes to the fabulous progress of the Canadian oil industry. Estimates place Canada's oil reserves between 23 and 30 billion barrels by 1980.

An important part of the oil man's team is the Petroleum and Natural Gas Department maintained by The Canadian Bank of Commerce at Calgary. This Department is staffed by men who *know* the oil industry. Their expert knowledge, backed by detailed and complete records of exploration and development, is available in Calgary, or can be obtained for you by any of our branches across Canada.

We invite you to call in and see this Department when you're in Calgary. For maps and other information write to: C. H. Munro, Manager, Petroleum & Natural Gas Department, 309-8th Avenue West, Calgary.

(The Bank does not advise on the merits of oil or mining securities)

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148 CV

Billion Barrels From Pembina

From a standpoint of recoverable oil, Alberta's Pembina field has been advanced to the billion-barrel class as result of pressure-maintenance programs. This estimate was made by Pembina Pipe Line Ltd.

First pressure-maintenance program was launched in the field in 1956, and more than two million barrels of water have since been injected into the Cardium sand. By November 30, 1957, program had been extended to nearly 50,000 acres on the field.

B.C. Gas Exploration Active

Hottest gas exploration area in western Canada is northeastern British Columbia—with six major discoveries in first two months of 1958. Prospect for earlier increase in export volume than from Alberta is sustaining wildcatting at high level. Important discovery area currently is North Boundary Lake—with five recent discoveries enclosing area of 200 square miles held by Northern Foothills Agreement Group.

SPC Extends Sask. Gas Service

The biggest pipeline construction year in its history is scheduled by Saskatchewan Power Corp. for extensions of natural-gas service. Total mileage will be over 400 miles, excluding service footage. At end of 1957, SPC had 574 miles of main transmission lines and 100 miles of gathering lines in operation.

Book To Commemorate Oil's 100th Birthday

A book to commemorate the 100th anniversary of the oil industry in the USA, entitled *Men of Petroleum Progress*, will be published and ready for delivery by December 15 of this year, according to James F. Pigg, executive director of the Petroleum Centennial Corp., Arlington, Texas. F. L. Eddins is president of the publishing corporation.

The book will outline the history of progress in the petroleum industry since 1859, when the first oil well was drilled in Titusville, Pa.

Champlin HF Unit Onstream

Champlin Oil & Refining Co.'s new HF alkylation unit at Enid, Okla., by Badger Manufacturing Co., Cambridge, Mass., has gone onstream. The 1,430 b/d hydrofluoric-acid alkylation unit will use the Phillips process and enable Champlin to turn out more of the high-performance components for use in new motor fuels.

Richfield In New Headquarters

Richfield Oil Corp. of New York has moved to its new offices to 708 Third Avenue. Company previously occupied offices at 579 Fifth Avenue. According to president Fred H. Meeder, purpose is to have all the company's departments and executive offices in one location.

Jennings For Foreign Policy Assn.

B. Brewster Jennings, former board chairman for Socony Mobil Oil Co., has been elected to the board of the Foreign Policy Assn., a national nonprofit organization devoted to citizen education in world affairs. Formerly assistant deputy administrator for tanker operations during World War II, Mr. Jennings was associated with Socony from 1920 until last February of 1958.

AAODC Annual Meeting

18th annual meeting of Am. Assn. of Oilwell Drilling Contractors will be held in the Adolphus & Baker Hotels, Dallas, Texas, October 1-3, 1958. 19th meeting will be in Oklahoma City, October 1959.

To Represent Delta Tank

Mid-Continent Supply Co. will be worldwide (except Mexico) exclusive distributor of the oil-field equipment products of Delta Tank Mfg. Co. of Baton Rouge, La. Joint announcement was made by president Ken W. Davis of Mid-Continent and president Hal S. Phillips of Delta. The sales agreement covers sales and service to the export, domestic and Canadian markets.

Heads New Tretolite Field Lab

Ed. L. Dresnel, of the Tretolite Co. division of Petrolite Corp. development laboratory in St. Louis, Mo., has been assigned to head the company's new field service laboratory recently completed at Odessa, Texas.

Refining In Switzerland

Soc. Financiere Italo-Swiss plans an oil refinery near Stabio, canton of Tessin. Investment would be 60 million Swiss francs (one Swiss franc equal to US 23.36 cents). Some 200 to 300 persons are to be employed, and about two million francs per year is to be paid in wages. Crude imports from Genoa, Italy, would supply the plant.

Chiksan Vice Presidents

Louis J. Smith has been appointed vice president and sales manager of Chiksan Co. and Chiksan of Canada Ltd., and Edward T. Landgraff has been made vice president and sales manager of Chiksan Export Co. Mr. Smith, who joined Chiksan in 1948 and has been eastern regional sales manager since 1951, will make his headquarters at Chiksan's main office and plant in Brea, Calif. Mr. Landgraff has been with Chiksan since 1946, and has been export sales manager since 1954. He will continue to headquarter at the company's Newark, N. J. office. Replacing L. J. Smith as eastern regional sales manager is John F. Powers, Jr., formerly senior field engineer.

API Tie-in With World Congress

Midyear meeting of the Division of Refining of the American Petroleum Institute will have an international flavor in 1959. Dates for this big gathering of American technologists, scientists, and manufacturing executives have been rescheduled so that the API sessions will tie in with the Fifth World Petroleum Congress. Both meetings will be held in New York—the API Refining Division being scheduled for May 27-29, and the international congress, May 31-June 6.

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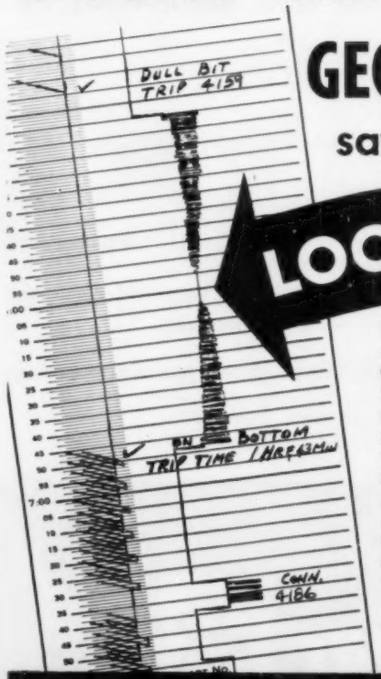

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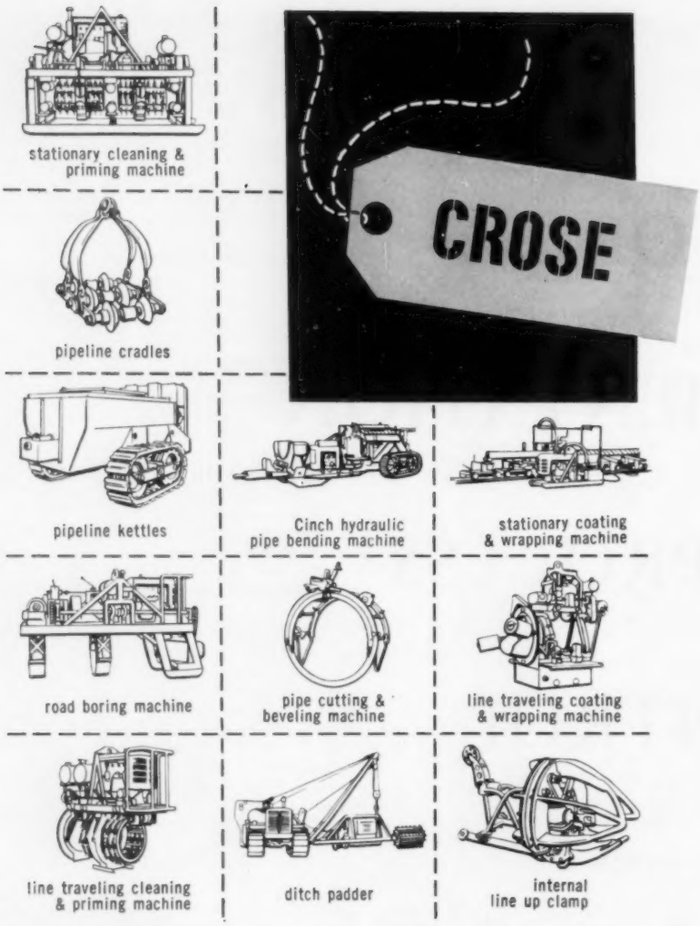

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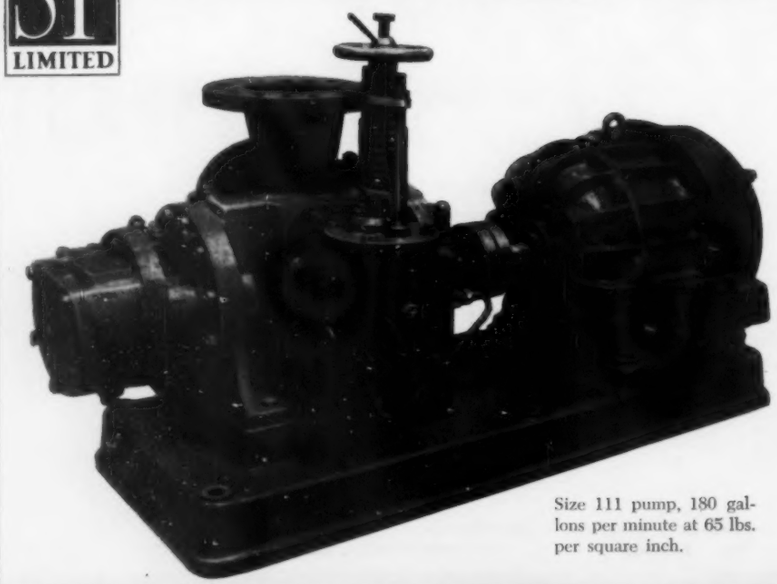

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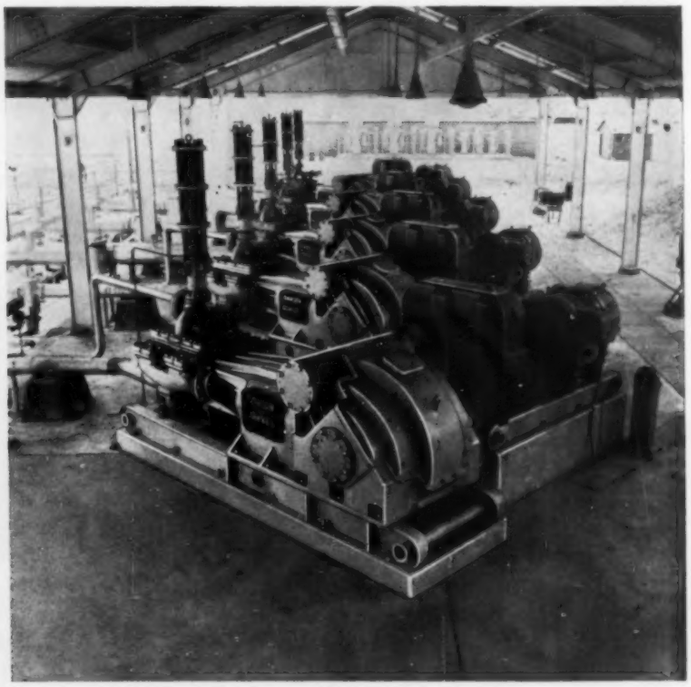

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Petrofina Takes Over Atlas

Agreement has been reached for American Petrofina Inc., to acquire all the major oil and gas holdings of Atlas Corp. American Petrofina is an integrated oil company, closely affiliated with Petrofina of Belgium which has worldwide oil interests. With the acquisition of the Atlas oil holdings, American Petrofina will have assets of more than $100 million and oil reserves close to 40 million barrels and gas reserves approaching 300 billion cubic feet.

Burma-Draft Oil Law

Draft is nearly complete on Burma's new oil law which was compiled with industry advice. It is expected to be passed this spring with no important changes. Principal terms are: *Reconnaissance:* Area: 2,000 sq. mi., no limit per company. Duration: 2 years. Two renewals of 1 yr. each. More at govt. option. Fees: Low. Same (approx.) as India's. *Exploration:* Area: 250 sq. mil, limit 2,000 sq. mi. per company. Duration: 3 years. Two renewals of 1 yr. each. More at govt. option. Fees: No bonus payment. About same as India's. *Exploitation:* Area: 5 sq. mi., maximum 300 sq. mi. per company. Duration: 20 years. Renewable for 20 years on same terms, but increase possible in royalty and dead rent payments of 100%. Authority given govt. to enact proration and conservation. Usual arbitration provisions. Fiscal provisions not specified in law. Subject to general taxes of country which has profits take of 60%.

New Capital for Canadian Oil

Huge sums of foreign capital will be necessary during the next decade for exploration and development in Canada, where more than 90% of exploration remains to be carried out, according to Shell Oil Co.'s Canadian president, W. M. V. Ash. At least eight billion dollars will be needed in the form of new capital investment over the next 10 years, and that much of this sum must come as foreign capital, according to Mr. Ash.

Rimrock Enters Foreign Field

Rimrock Tidelands Inc. has purchased Mofag Oil Exploration Co. Inc., a Swiss corporation which owns oil exploration concessions in Switzerland and France. Joseph L. Hargrove will direct Rimrock's foreign operations. Besides two Swiss concessions, Mofag owns one-third interest in a 500,000-acre concession in the Aquitaine basin, the most important French oil province, located some 85 miles northeast of Bordeaux. The 2½-year-old Zürich, Switzerland-based firm also recently conducted five exploratory drilling tests in Italy.

Scurry-Rainbow Farmout to Royalite

Royalite Oil Co. Ltd. has acquired a farmout from Scurry-Rainbow Oil Ltd., Calgary, on tar-sands permit No. 23, which contains about 50,000 acres in which Scurry-Rainbow held a 40% working interest. Terms of the agreement provide for "substantial" cash bonus plus a 2½% gross overriding royalty from all substances on which Alberta government will receive royalties.

Royalite and associates now have a $50 million development project under way in the oil-sands region of northeastern Alberta.

Union Acquires Dominion's Gas

Union Gas Co. of Canada Ltd. will acquire natural-gas production, and transmission and distribution facilities operated by Dominion Natural Gas Co. Ltd., in Ontario, under an agreement announced in Chatham, Ont., by the two companies.

Esso Computer Pilot Plant

A computer-controlled pilot plant to save scientific manpower and speed development of new refining processes will be acquired by Esso Research and Engineering Co. The automatic miniature plant is being built by Systems Division of Consolidated Electrodynamics Corp., Pasadena, Calif., in cooperation with the oil research firm. It will be compact enough to fit into an average-sized (10-ft x 12-ft) office. Esso Research uses about 100 such pilot plants with capacities ranging from a tablespoon of gasoline or other oil products up to 100 b/d.

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Saskatchewan Oil Activity

(Continued from page 112)

hold acreage due to expire during the first half of 1958. Cash bonus bids for government exploration permits continued at an active pace and there was a net increase in permits outstanding of 54 parcels amounting to 4,970,881 acres. This addition brought the total acreage under permit at the end of the year to 25,215,115 acres, made up of 287 parcels of land.

Both the drilling reservation and lease sales showed a slowing trend during 1957. Part of this fact possibly is due to the high pitch of activity in the southeast area of the province, where emphasis was on development drilling. Drilling reservations showed a net decrease of five parcels, amounting to 4,840 acres—leaving a total of eight parcels under reservation at the end of the year, representing some 61,840 acres. Lease and crown reserve sales brought several record amounts. Leases dropped by 142, and the acreage under lease by 386,500 acres—which left a total acreage under lease at the end of the year of approximately 6,378,928 acres in 4,088 leases. Major center of leasing was in the south half of the province.

Considerable interest was added in 1957 by the exploration of the deeper formations by Imperial Oil Ltd., which embarked on a program to test the Ordivician in the south-central area of the province, near the United States border. In the third well, Imperial received some encouragement. The well, Hummingbird 6-13, was drilled about 8 miles north of the border and about 11 miles east of another of Imperial's deep tests, Herald 1-13—drilled and abandoned earlier in the year.

Initial tests of the Hummingbird well revealed oil and water-cut oil in the interval below 9,949 ft. The well has been cased, and a special pump installed, to produce from the deep formation. Drill-stem tests presently are being run; and, though results have not been released, it is known the oil produced has a high salt-water content.

Imperial's efforts support the views of many oil men that there is oil to be found in these deeper formations. This is supported not only by the Hummingbird well, but also by several recent successes in Montana—where some good Ordivician finds have been made. The high costs make difficult any prediction as to whether exploration of these deeper formations will become a significant factor during 1958. Possibility of deeper production has sparked some interest in deeper seismic surveys and the acquisition of any available leases in the Williston Basin region of Saskatchewan.

Another discovery was made during the year which could have a pronounced effect on future exploration and development in the southeast part of the province. Production was found late in August from a light oil pool, 12 miles east of the town of Wapella, in a different formation from that currently producing oil in the area.

Production—Previous Records Fall: Southeastern development drilling continued active in the hottest oil-development area in western Canada. More than 90% of all completions—both wildcat and development—were made in this region. This swing of activity has been in evidence for three years, but 1957 seemingly climaxed the movement. Southeastern areas continued to show large increases in drilling, while all other areas experienced a decline. Impetus was added also by the excellent discovery ratio prevalent in that area during the past three or four years. Such companies as Imperial Oil, British American Oil, Tidewater, Canadian Devonian, Shell of Canada, Canadian Oil Companies Ltd., Texaco, Woodley-Canadian, Mobil Oil, Canadian Superior, and others carried out extensive wildcat and development drilling programs.

Several signposts point up the significant accomplishments of the industry in Satkatchewan during 1957 in the development drilling phase. Well completions increased 130 over the previous year—with 1,231 completions during 1957. New oil wells numbered 844, which gave Saskatchewan an overall discovery ratio of 8.9 out of every 12.3 wells—down only slightly from 1956, when the ratio was 8.9 out of every 11.8 wells.

Along with increased development drilling, there was a 15% rise in the footage drilled in the province. In 1956, footage drilled was 4,724,954 on all wells; during 1957 this rose to 5,300,329 ft—an increase of just over 575,000 ft.

Drilling operations increased markedly in efficiency during 1957. The number of drilling rigs per month operating in the province throughout the year showed no increase over the previous year; in fact, the total showed a slight drop in rigs operating during 1957. Despite this, number of wells drilled rose by 14% over 1956, and footage drilled increased by 15%. This could only have been accomplished by better utilization of rig time. The ever-present problem of costs encroaching on profit margins has tended to promote more efficient operations. Increased development drilling in a smaller area of the province has made it possible to cut "downtime" by shorter moves between contracts. In addition, greater economy in the use of drilling and completion equipment has been stressed; as, for example, experiments in certain areas to test such variations as smaller casing—allowing the use of smaller drill pipe and drill bits. Average cost of drilling a well in the province is considered to be around $60,000 to $65,000 per hole—this, of course, varying with the area and difficulties involved.

Development drilling in the major fields is shown in the following tabulation:

FIELD	DEVELOPMENT WELLS 1957 OIL	DRY	TOTAL
Steelman	255	25	280
Weyburn	210	5	215
Carnduff	106	7	113
Midale	46	0	46
Oxbow	39	5	44
Auburnton North	21	3	24
Nottingham	19	5	24
Instow	17	1	18

Total number of wells capable of production at the end of 1957 was 3,243. The 3,000th producer was brought into production early in September 1957. The first producer was a discovery at Lloydminster, in November 1944; the 1,000th producer was drilled in the Lone Rock field in October 1954; and, two years later, the 2,000th well was brought in at Steelman.

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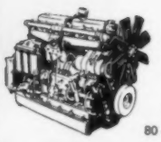
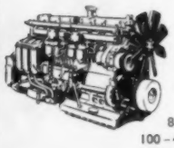
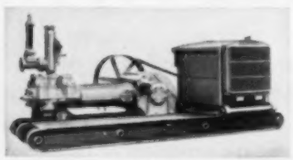
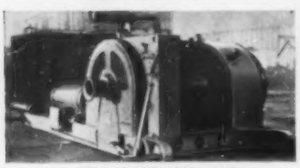

6 Cylinder
80 - 300 b.h.p.


8 Cylinder
100 - 400 b.h.p.

Pulsometer Pump


Dawson and Downie Pump

Oweco National Drilling Rig


Woodfield Swabbing Unit

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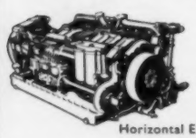
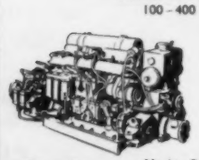
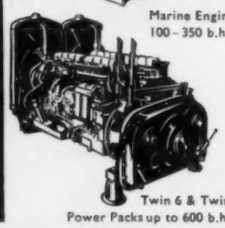
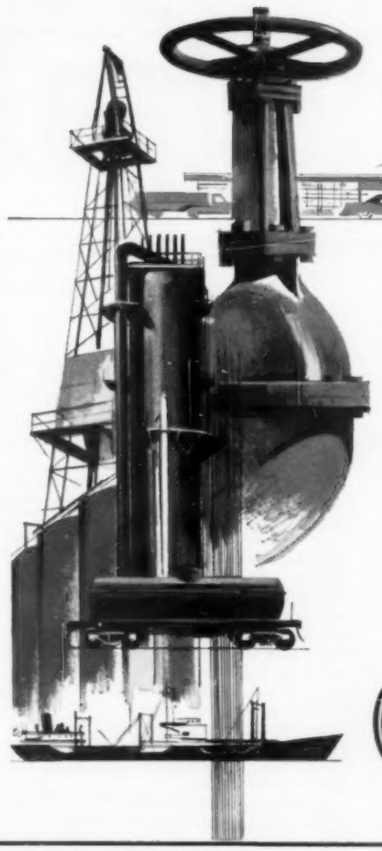

Horizontal Engines
100 - 400 b.h.p.


Marine Engines
100 - 350 b.h.p.


Twin 6 & Twin 8
Power Packs up to 600 b.h.p.



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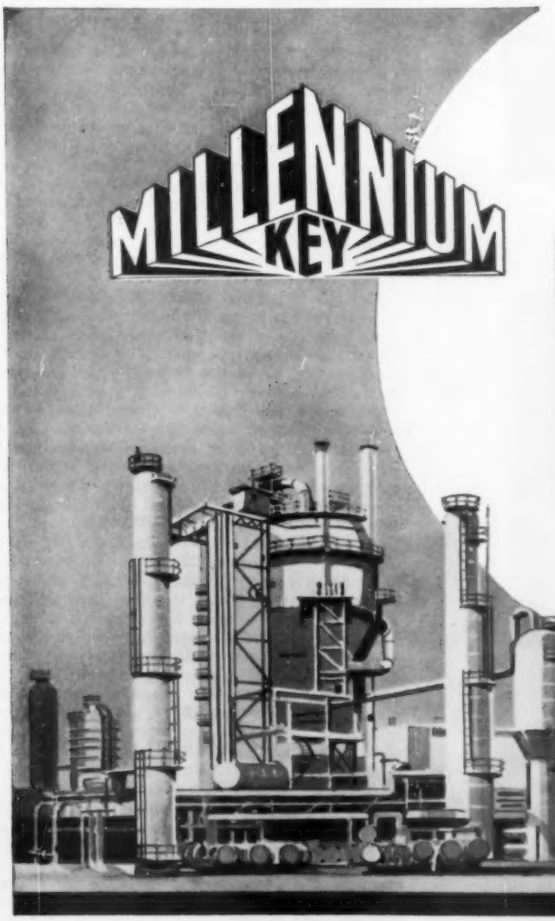

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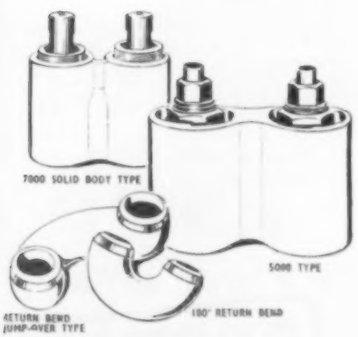

Lake & Elliot Ltd.
BRAINTREE · ENGLAND

The year's development showed the Weyburn field as the largest light-gravity oil field in the province. Only three years old, the field already embraces some 27,000 acres, and still is not outlined. Typical of the Weyburn field are pay zones as thick as 100 ft, and MPR's range up to 350 b/d. By year-end, the field had 273 wells capable of production.

Steelman is the largest field in the province, and among the largest in western Canada. The field was defined in 1957—with current acreage totaling 155,000, and 602 wells capable of production.

Gas-well drilling saw a slight increase over the previous year—with one wildcat gas discovery. There were 14 wells drilled in 1957, compared with 10 in 1956. Five of these were drilled in Coleville-Smiley—major gas field in the province. The field had 47 wells capable of being operated at the end of the year. Total gas wells capable of production is currently 168.

With additions made during the year to total oil and gas wells in Saskatchewan, crude-oil reserves currently are estimated at 600 million barrels, and natural-gas reserves at one trillion cubic feet. These figures—which include both proved and probable reserves—are based on computations of the Canadian Petroleum Assn.

Crude production in 1957 totaled 36,861,089, bbl, or 100,000 b/d average, showing a substantial gain over the 1956 total of 21,077,371 bbl, or 56,800 b/d. Total gain, 1957 over 1956, is thus about 80%. Largely responsible was the growth of the market outlet to the northern USA. By year-end, Saskatchewan was producing 32,000 b/d for export, as compared with average 19,000 b/d during 1956.

Gas Conservations: With the growth of fields in the southeast section of the province, flare gas has become a problem during the past two years, and gas conservation was thus a key activity during 1957.

Construction began in April on a gas-conservation plant in the town of Smiley. The Imperial Oil Ltd. plant will process gas collected in the Smiley field in west-central Saskatchewan. The plant will process about 3 million cubic feet of gas per day. Gas collection will be through 10-in. gathering lines

TABLE I
Saskatchewan—Drilling and Production, 1957

Month	Footage Drilled (Thousands of Barrels)	Crude Production
January	339,700	2,579
February	382,343	2,497
March	526,820	2,871
1st Quarter	1,248,863	7,947
April	162,559	2,509
May	499,418	2,836
June	657,694	3,059
2nd Quarter	1,319,671	8,404
July	593,912	3,127
August	506,789	3,309
September	468,336	3,345
3rd Quarter	1,569,037	9,781
October	409,087	3,654
November	401,227	3,270
December	352,444	3,804
4th Quarter	1,162,758	10,728
Year Total	5,300,329	36,860

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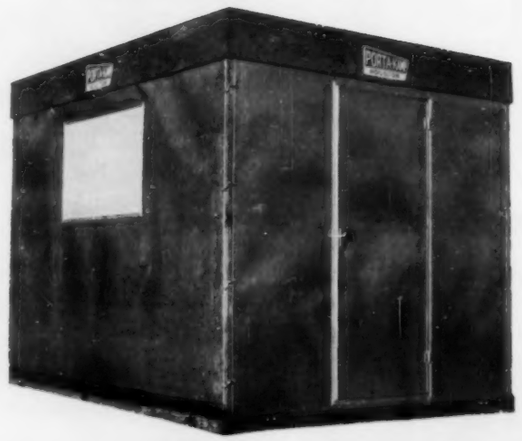

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- Weight 850 lbs.
- Collapsed size: 8' x 10' x 13"

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—with work on this system beginning in mid-June. Processed gas will be purchased by Saskatchewan Power Corp.

An interesting sidelight was supplied by the competition for a permit from the government to operate a gas-conservation plant in the Steelman field in southeastern Saskatchewan. Several companies applied for the permit—including American and Canadian concerns. Permit was awarded the Provo Gas Co., which has proceeded with plans to construct and operate the plant. Estimated cost of plant and equipment is $15 million. Upon completion, processing capacity will be 25 million cubic feet of flare gas per day. Permit to construct the transmission lines was granted Saskatchewan Power Corp. Construction of these lines is estimated at $5 million.

At present, it is estimated that 17 million cubic feet of gas per day is being flared in the Steelman field—expected to rise to 25 million by plant completion the end of this year. Long-term estimates are that between 50 and 60 million cubic feet of gas per day will be obtained in the southeast corner of the province.

Crude-oil conservation also was an important activity—with several pressure-maintenance projects begun during the year. The largest of these is a pilot water-flood project in the Steelman field, which began with the drilling of the first of the salt-water injection wells. Other applications considered by the Department of Mineral Resources during the year included applications for 17 dual completions, as well as for seven salt-water disposal wells.

Big Pipeline Year: The 1957 construction season was an active one for both gas and oil pipeliners in Saskatchewan.

Though not the highlight of 1957 oil activity, pipelines played an important role in making the year a successful one for production in the province. Importance of pipeline operations is borne out by the fact that there are presently nine companies with head offices or branches in Saskatchewan.

$20 Million Net from 1957 Operations: The rapid growth of Saskatchewan oil during the past few years has meant large increases in royalties and other revenues to the province. In the current fiscal year ended March 31, oil revenues to the provincial treasury are estimated at $20 million—contrasted with the 1955-56 revenues of $7,952,000.

In 1957, the oil industry contributed $78 million toward a total provincial income of $1.4 billion. Industry as a whole accounted for 65% of the provincial income—marking the first time in history that the nonagricultural sector of the provincial economy accounted for more income than the agricultural. The Saskatchewan Department of Mineral Resources has estimated a gross output of $69.1 million for the petroleum industry in the province during 1957—including $68 million for oil and over $1 million for natural gas. Representing production of 37 million barrels of oil and 12 billion cubic feet of natural gas, these figures are almost double those for 1956—when gross value was $35.9 million for 21 million barrels of oil and 8.8 billion cubic feet of gas.

Expenditures for petroleum development also have followed a pattern of sharp increases over the past three years. It is estimated $220 million was spent in the province during 1957—again almost double the 1956 figure and almost three times the amount spent in 1955. END

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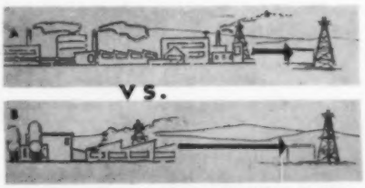

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Bourdo in Lebanon

The K. L. Bourdo Co., oil-field supply sales and service organization with headquarters in Beirut, Lebanon, has established offices in Tripoli, Libya, with Wesley Bourdo as manager. The Bourdo Co. handles Ideco sales and service in the Middle and Near East and in Northeast Africa.

Electro Stabilizer

Electro Tool Corp., Houston, has announced an improved model—Series 1200 Electro Stabilizer, which employs a powerful permanent magnet to eliminate or reduce scale and corrosion in flow lines. Earlier models have been field-tested in 3,000 installations.

Wilson To Distribute For Lone Star

Wilson Supply Co., Dallas, Texas, a leading oil-field supply house, has been added to Lone Star Steel Co.'s list of distributors.

Phil Clarke has been named manager of hot-roll steel products for the Lone Star Steel Co., Dallas.

Refinery Engineering Has New York Office

Refinery Engineering Co., of Tulsa, has opened a district office at 10 Rockefeller Plaza, New York. Henry T. Fielding, Jr., as new Eastern district manager, is in charge. His latest position, before joining Treco, was with Borg-Warner Corp.'s Pesco Products Division. Previously, he had been executive assistant to the vice president in charge of sales for M. W. Kellogg Co., in New York.
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1957 Austrian Production Down

Austria produced, in 1957, 3,185,598 metric tons of crude (1956: 3,427,749 tons) and 758,514,200 cubic meters of gas (1956: 744,918,500 cubic meters). Share of the State company OeMV was 3,007,325 tons of crude; this is 8% less than in 1956 (3,247,249 tons). Natural-gas production increased from 733.3 million cubic meters to 745.7 million cubic meters in 1957.

At the end of 1957, OeMV had 222 flowing wells (1956: 238), 16 gas-lift wells (18), and 586 pumpers (479). Average crude yield per well per day was 10 tons (1956: 12.2 tons). OeMV expects its crude production in 1958 will not exceed 2.7 million tons.

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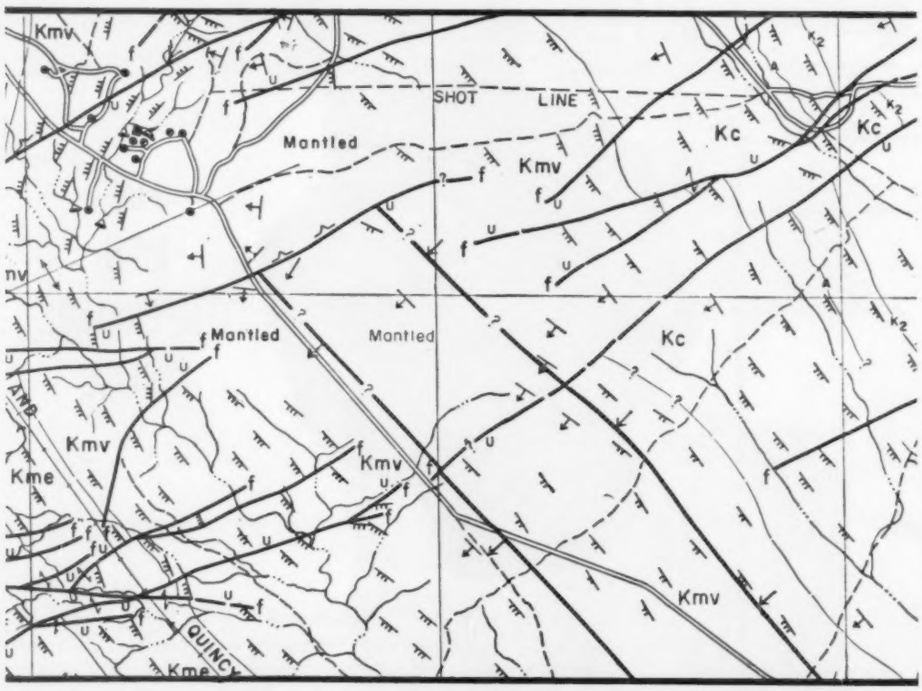

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JAMES A. RICHARDSON has been elected a director of Hudson's Bay Oil and Gas Co., Ltd.

CARL C. WHITAKER has been appointed superintendent of operations for Trans-Canada Pipe Lines Ltd., and will make his headquarters in Toronto.

WILLIAM B. PADON, of Tulsa, Okla., has been elected a vice president and a director of Transwestern Pipeline Co., owned jointly by Monterey Oil Co., J. R. Butler, of Houston; and W. K. Warren, of Tulsa.

GORDON OATES, of Toronto, has been presented with the Shell Oil Trophy as Canada's top glider pilot in 1957. The trophy was presented to Mr. Oates, a stress engineer at Avro Aircraft. by G. Sellars, Eastern Division aviation manager for Shell of Canada.

JEROME C. EPPLER has been elected to the board of Vickers Petroleum Co. Inc., Wichita, Kans. He is a partner in Cyrus J. Lawrence & Sons, New York investment firm.

J. C. STIRTON, Arabian American Oil Co.'s vice president in charge of engineering and construction, departed from his headquarters in Dhahran, Saudi Arabia, for retirement, May 1. With Mr. Stirton's retirement, L. M. Snyder, previously Aramco's vice president in charge of operations, has assumed the position of vice president in charge of engineering, construction, and local sales. W. R. Cooper has become general manager for engineering and construction, reporting to Mr. Snyder.

C. W. BUTLER has been appointed director of the Automotive Engineering Division, Gulf Research & Development Co., Pittsburgh, Pa.—succeeding J. E. Taylor, appointed director of automotive research and assigned to the company's newly opened office in Detroit. In his new position, Mr. Butler, a veteran of 25 years with Gulf, will be responsible for directing the activities of approximately 130 personnel engaged in research on the company's automotive and aviation products.

E. J. McCLANAHAN has been appointed director of marketing for Standard Oil Co. of California, San Francisco. He has been chairman and president of Standard Oil Co. of California, Western Operations Inc., and will continue as board chairman. He also is a vice president and director of the parent company.

H. G. Vesper has been elected president of Western Operations Inc. He formerly was vice president for marketing.

PAUL E. FIEBIG, senior landman for Sinclair Oil & Gas Co. at Amarillo, Texas, has ben promoted to district landman in charge of Sinclair's Amarillo office.

Pioneer W. M. Irish Dies

William M. Irish, pioneer oil man and former president of The Atlantic Refining Co., Philadelphia, Pa., died in St. Petersburg, Fla., February 13, where he had gone for a vacation. He would have been 90 years of age in June.

Mr. Irish had been a director of Atlantic for 32 years; former secretary and vice president; and president for a decade. He retired in 1937. At the time of his retirement, he had put in 47 years in the oil business, having been employed by the old Standard Oil Co. in 1890. He moved to Philadelphia from Lima, Ohio, with the late J. W. VanDyke, who became Atlantic board chairman when Mr. Irish assumed the presidency.

Alexander Bell Dies

Alexander Hamilton Bell, pioneer California oil man, and a former Continental Oil Co. executive who had been associated with D. H. Burden in the contract drilling business since 1947, died in Pasadena, Calif., recently. He was a past chairman of the local chapter of American Association of Oilwell Drilling Contractors and a director of the national association.

H. EDWARD WOLF has been appointed president of Erie Natural Gas Co. Inc., Erie, Pa.

P. J. MERKUS, formerly manager of Shell Oil Co.'s Wilmington, Calif. refinery, has been named manager of the Wood River, Ill. refinery—succeeding H. D. Dale, retired. G. C. Montgomery succeeds Mr. Merkus at Wilmington.

WILLIAM H. YOUNG has been elected vice president of Felmont Oil Corp., Bradford, Pa., domestic operating subsidiary of American Maracaibo Co.

RUSSELL C. HOLCOMB has been appointed assistant manager of Sun Oil Co.'s New England region, headquartered at Boston, Mass.—succeeding John M. Jasperson, retired.

CLARK P. LATTIN, Jr., has been elected vice president and general manager of the process plants division of Foster Wheeler Corp. He formerly was manager of sales for that division. Mr. Lattin has worked for Foster Wheeler since 1938, as a design engineer, manager of Boston sales office, and later as assistant to the vice president in charge of sales.

GEORGE LEO SWITZER, 61, retired marketing retail manager of Shell Oil Co., died on March 15 while vacationing in Fort Lauderdale, Fla.

PAUL E. HUBER, of Louisville, Ky., has been appointed production manager of Catalysts and Chemicals Inc., a producer of specialty catalysts for the petroleum and chemical industries.

FRANK COOTER of Midland, Texas, has been appointed representative in Santa Fe, New Mex., and E. J. Gemmill southwestern division exploration manager for Cities Service Oil Co.

Mr. Cooter has a long career in land-leasing work with Cities Service. Mr. Gemmill, the new southwestern division exploration manager, is another longtime Cities Service employee.

FRANK R. FISHER and C. J. Francisco have been elected vice presidents of Sinclair Research Laboratories Inc., wholly owned subsidiary of Sinclair Oil Corp. Mr. Fisher will be in charge of operations, while Mr. Francisco will be concerned with patent and licensing matters.

BEN R. HOWARD, formerly chief geophysicist for Warren Petroleum Corp., has been named chief geophysicist for Republic Natural Gas Co., Dallas.

WILBUR A. WALZ has been named marine transportation manager for the American Oil Co.—succeeding John Rae, retired. Mr. Walz joined American Oil in 1934, and served in the credit, jobbing, and marine departments before receiving his latest appointment.

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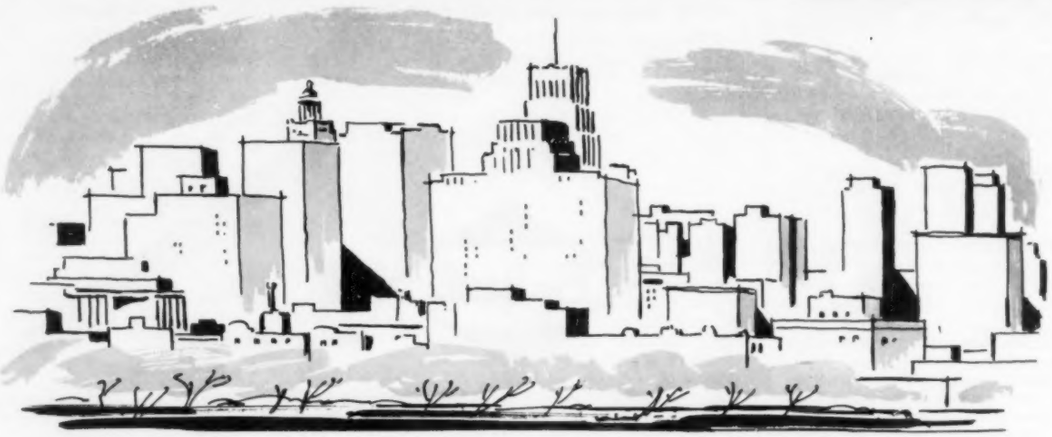

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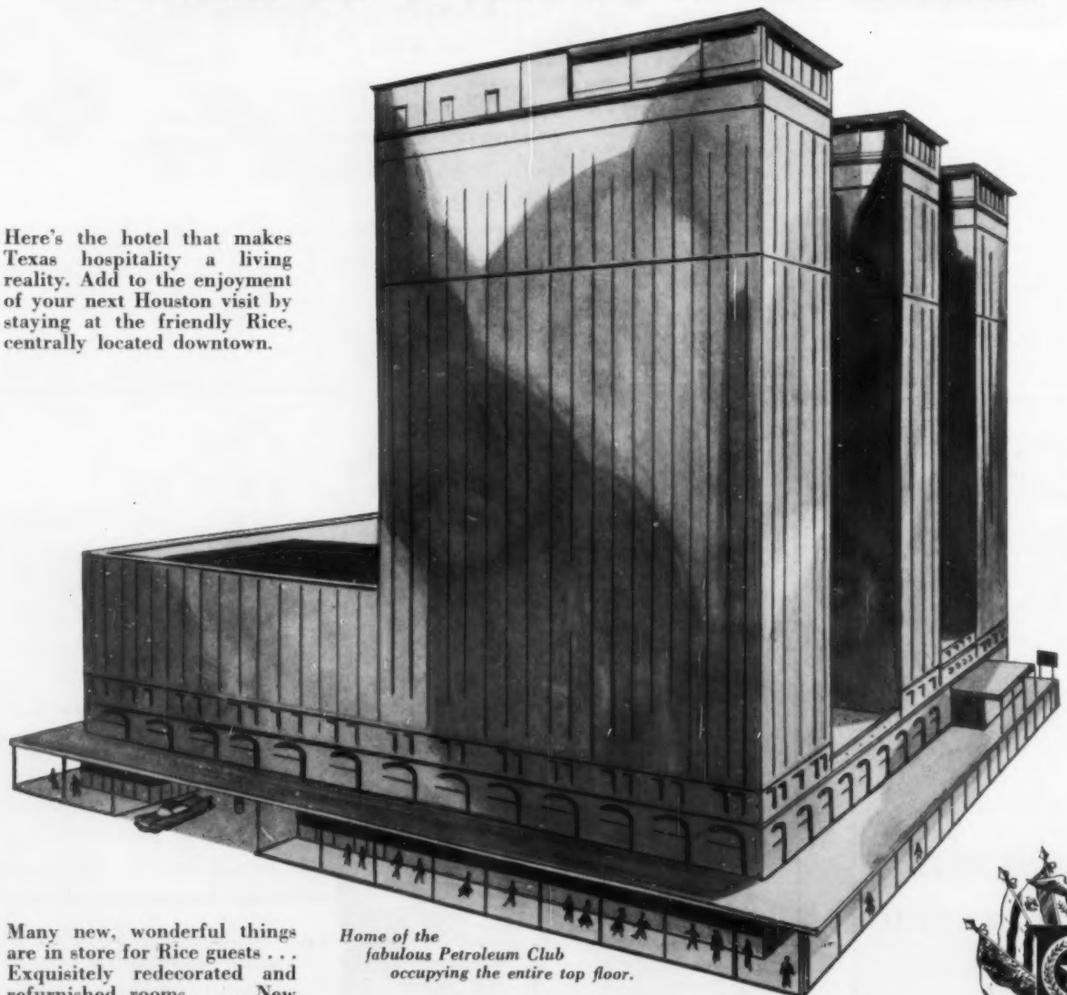

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ALVAH E. ESSER has retired from Socony Mobil Oil Co. Inc., New York, where he has been manager of the engineering department since 1938. He has been with the company 43 years.

GENE A. NORTHINGTON has been appointed assistant manufacturing coordinator in the executive office of International Petroleum Co. Ltd., at Coral Gables, Fla.

G. S. MORRISON has received appointment as manager of head office, lubricants department, Shell Oil Co. of Canada Ltd. He formerly was Toronto district manager. M. E. Falby has been appointed as safety representative for the company, in Edmonton. Mr. Falby previously was safety representative in the Calgary area office.

R. H. (HARVEY) RICHARDSON has joined Liberty Drilling Corp., of Houston, as vice president and general manager. The drilling company currently has four rigs operating on the Gulf Coast.

L. EDWARD TINNELL has been appointed purchasing agent and manager of general service department of Lion Oil Co. to succeed R. E. Meinert, who will continue as vice president and management assistant in the purchasing and general services field. Mr. Meinert joined Lion in 1929, and was made vice president in 1943.

ED BREDIN, city solicitor for Calgary since 1950, has received appointment as general counsel for Mobil Oil of Canada Ltd.—with headquarters at Calgary.

A. V. WINTHER, assistant to vice president of Standard Oil Co. of Texas in charge of purchasing and motor vehicles, retired on March 1. He has been with the company for 30 years in purchasing and administrative work.

GORDON D. KERNS has been appointed senior technologist at the Potwin, Kans., refinery of Vickers Petroleum Co. Inc.

DAVID P. HANKINS has been appointed to the newly created positino of manager of Pure Oil Co.'s Lemont, Ill., refinery, and Dale G. Miller, general superintendent. Willard G. Dailey is the new manager at Heath, Ohio, refinery. Harry Hook and Jack N. West have been promoted to the positions of general superintendent at the Heath and Toledo refineries, respectively.

DOUGLAS P. BAILEY has been named manager of the purchasing department, The Texas Co., New York—succeeding Howard S. McCray.

JOHN C. LUDWICK, JR., sedimentologist, Gulf Research and Development Co., Harmarville, Pa., and William R. Walton, geologist, Pan American Petroleum Co., Tulsa, Okla., have been selected to receive the 1958 president's award, of the American Assn. of Petroleum Geologists.

WILLIAM H. GORYL has begun a rotational assignment as an assistant director in the design engineering division of Esso Research and Engineering Co., Linden, N. J. He's had a number of overseas assignments in connection with startups and design work for refineries in France, Belgium, Germany, South Africa, Italy, and Venezuela.

HARRY J. KENNEDY, senior vice president of Continental Oil Co., has been re-elected president of the Western Petroleum Refiners Assn., at the group's 46th annual meeting in San Antonio.

Sunray's Forster Dies

Warren D. Forster, 66, corporate secretary for Sunray Mid-Continent Oil Co., Tulsa, Okla., died of a heart attack on March 22. He was to have retired July 1, after completion of 30 years with Sunray. He first joined C. H. Wright, now Sunray chairman, in 1919; and in 1928 joined Mr. Wright in the new Sunray organization as assistant secretary in the Tulsa office.

EVERETT R. FILLEY, 63, of The Texas Co., died recently at his home in Greenwich, Conn. A native of Filley, Nebr., and a Drew University honorary doctor of laws, he was named last year senior vice president in charge of Texaco's worldwide producing activities.

EDMUND R. LEHMANN has been appointed manager of application engineering for the industrial controls division of Manning, Maxwell & Moore Inc., Stratford, Conn. Previously with Fisher & Porter (Canada) Ltd. and McColl-Frontenac Oil Co., he is a past president of the Montreal chapter of the Instruments Socy. of America.

DR. WILLIAM WYMAN MALLORY has recently joined Ball Associates, oil and gas consultants, at Denver, Colo., to specialize in exploration for oil and gas in the Rocky Mountain region. He has been supervisor of stratigraphic projects in the area for Phillips Petroleum Co.

L. WILLIAM MOORE, president of American Oil Co., has been appointed to the advisory committee of the 41st St. Branch of Chase Manhattan Bank, New York. A former research chemist for Standard of Indiana, he was elected 1st vice president of American Oil in 1953, executive vice president in 1954, and president in 1957.

E. L. STAUFFACHER, president of Cities Service Oil Co., has been appointed chairman of the Petroleum Division of the New York City Cancer Committee's 1958 Cancer Crusade—succeeding Burl S. Watson.

Dr. GORDON H. STILLSON, of Gulf Research & Development Co., with laboratories in Harmar Township, near Pittsburgh, Pa., has been named business manager of the research center—succeeding Horace W. Daugherty, retired. Dr. Stillson has been assistant director of this division for the past 10 years.

J. E. TAYLOR has been named director of automotive research for Gulf Research & Development Co. Formerly director of Gulf's automotive engineering division in Pittsburgh, Mr. Taylor has moved to a newly opened office in Detroit, Mich., where Gulf's automotive research program can be coordinated with that of the automotive industry.

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CANADIAN OIL AND GAS is the only publication which sets out clearly and concisely the law relating to the Industry in Canada. In it will be found the statement of the law complete with notes of the latest court decisions and all the relevant forms. Included also is the complete text of all orders, regulations, statutes and government policy letters of general application.

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The authors are experts in their subject. Mr. David E. Lewis is a member of the Alberta Bar and Regional Solicitor, Imperial Oil Limited, Producing Department (Western Region) and Mr. Andrew R. Thompson is a member of the Alberta, Manitoba and Ontario Bars and Associate Professor, Faculty of Law, University of Alberta.

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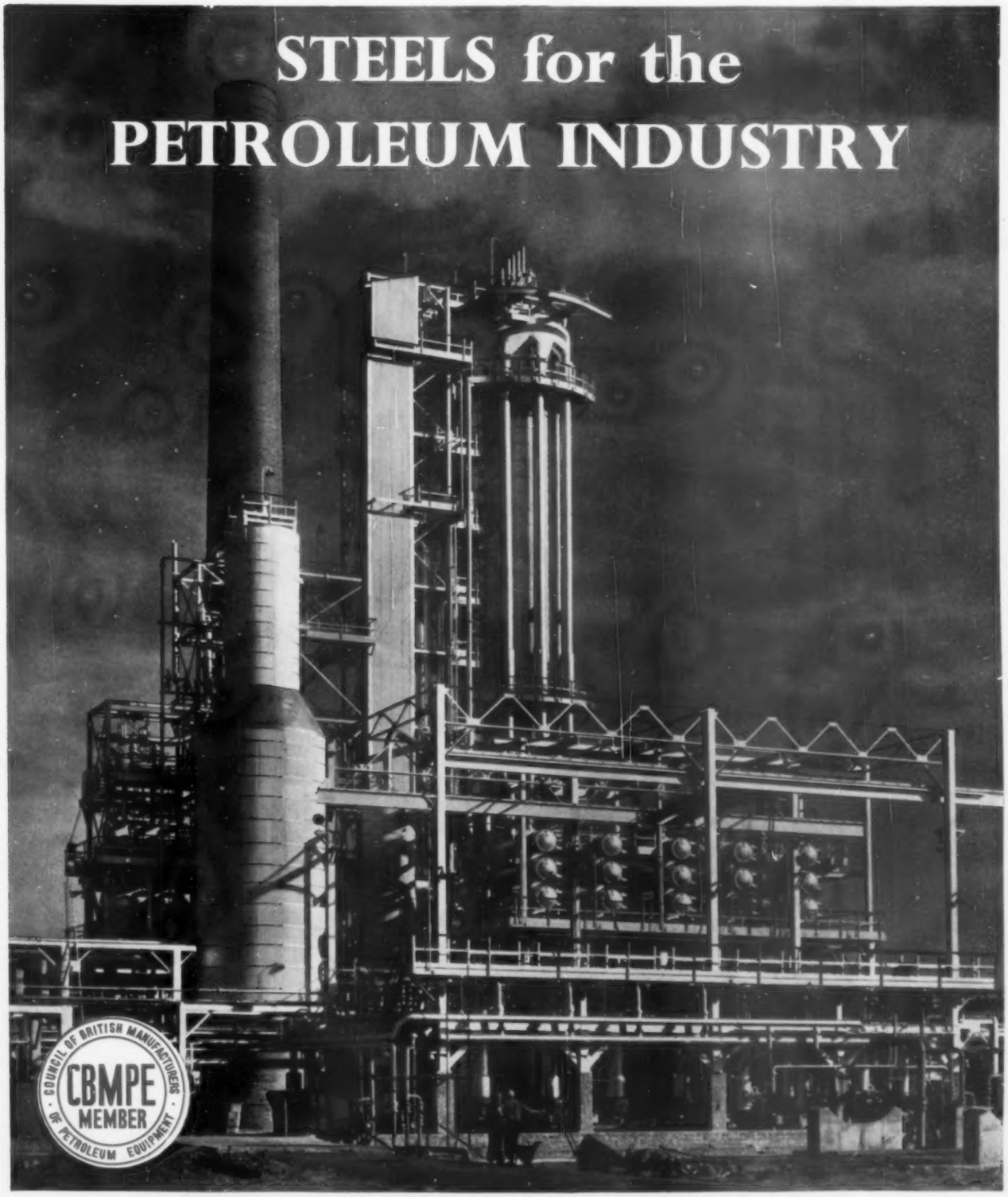

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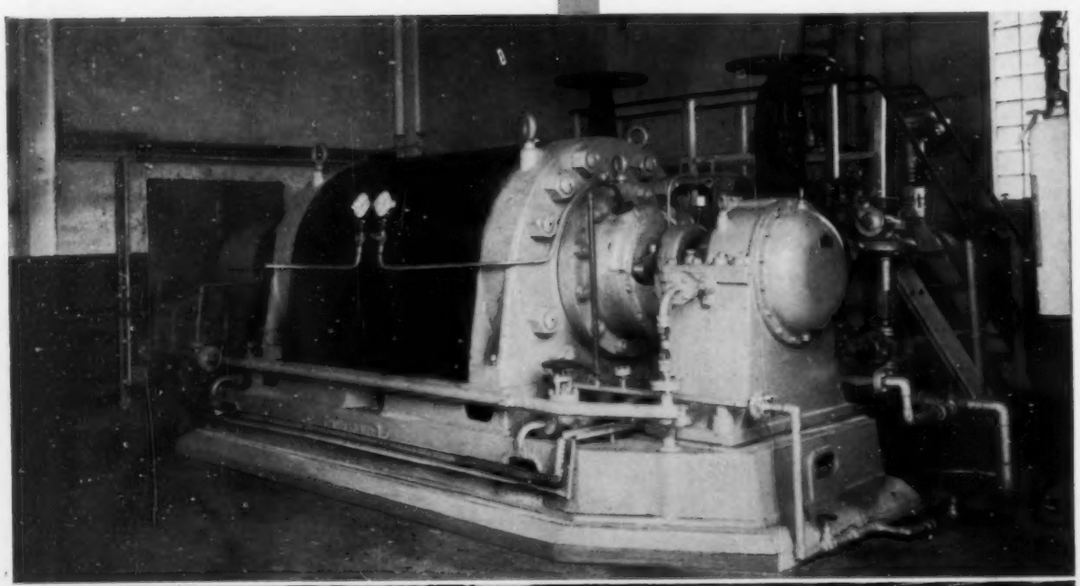
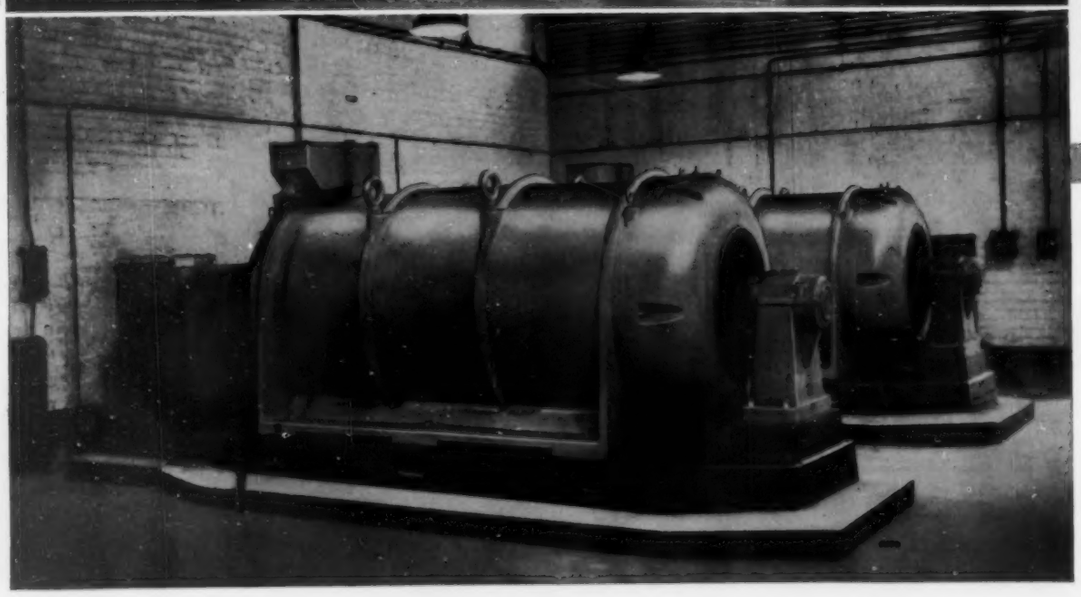


A Mather & Platt Plurovane pump rated to deliver 1760 g.p.m., of crude oil at a head of 2100 feet installed at a Scottish oil pipe-line booster station.



Two 1000 h.p. flameproof motors installed to drive Mather & Platt oil pumps in the famous Oil Pipe Line round Britain.

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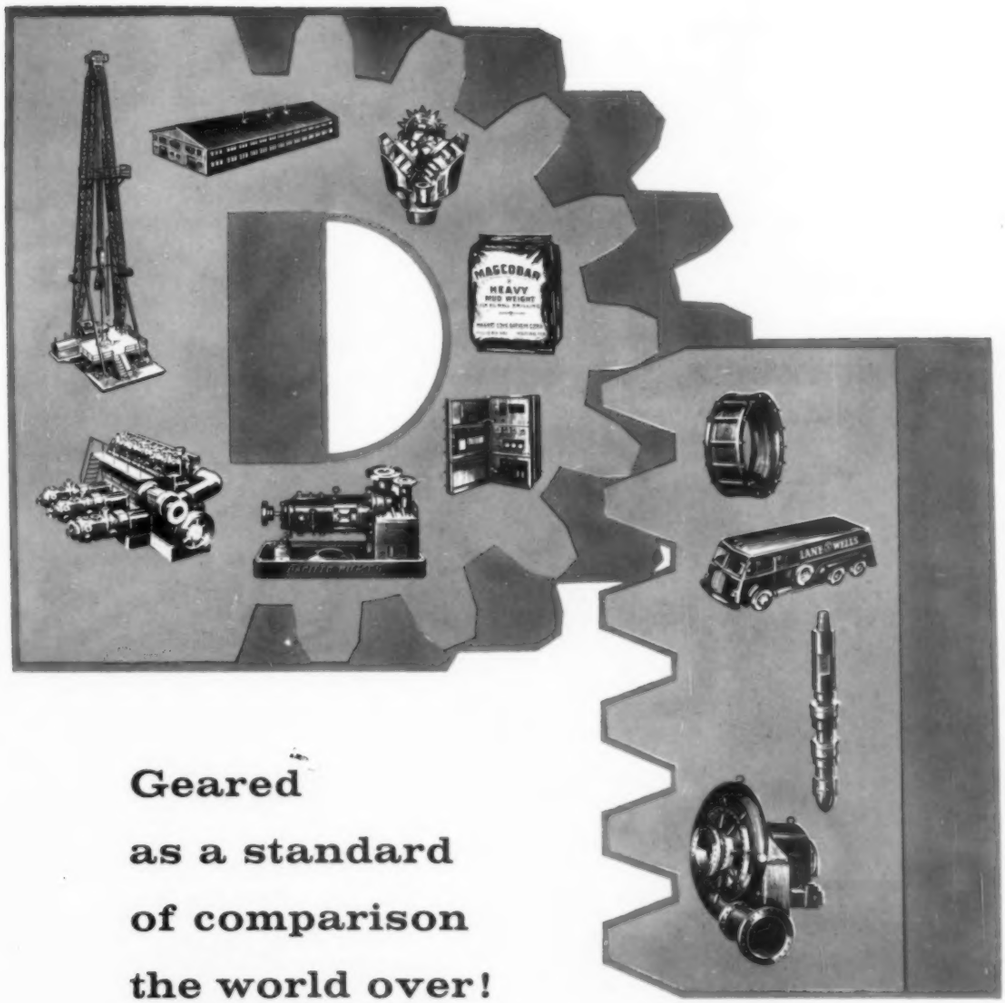

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